ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

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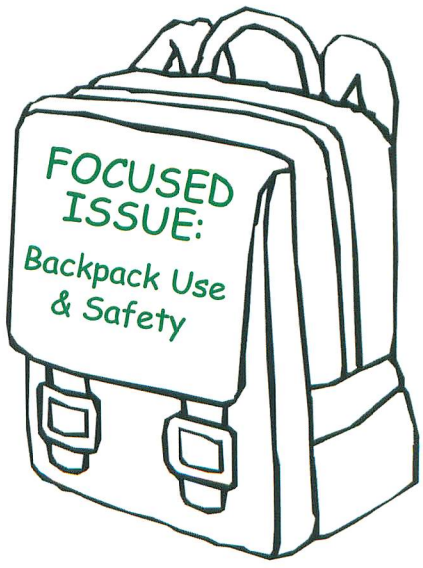

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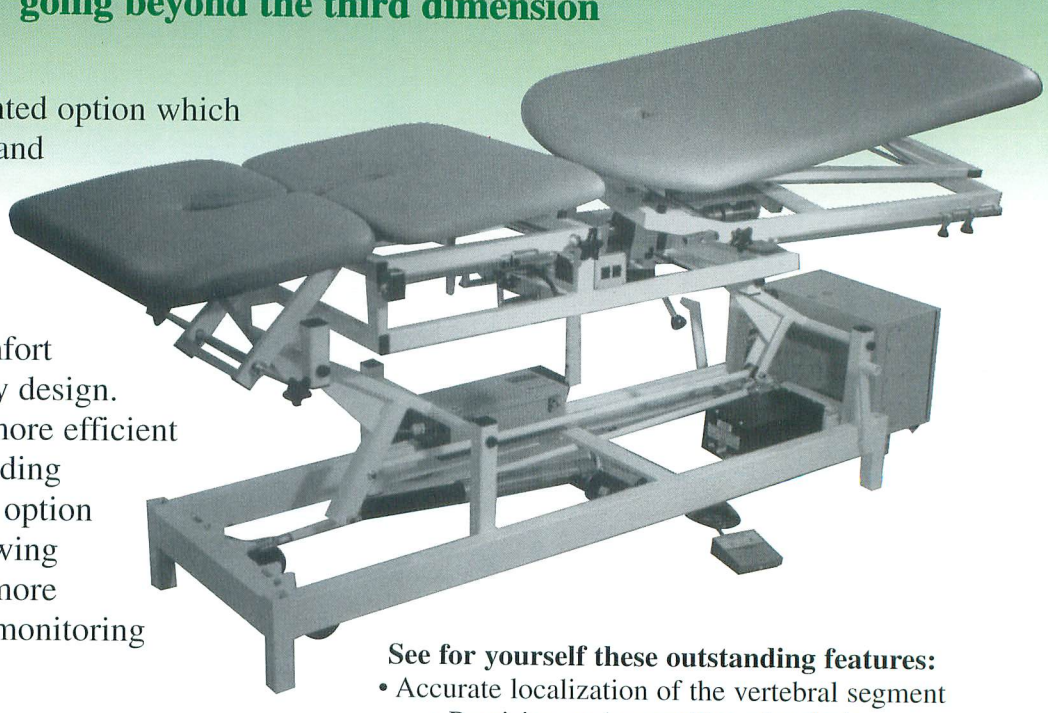

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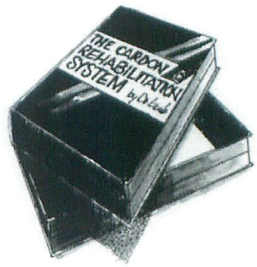

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- Advancement of education and clinical practice,
- Facilitation of quality research, and
- Professional development of members.

PUBLICATION STAFF

MANAGING EDITOR & ADVERTISING
Sharon L. Klinski
Orthopaedic Section, APTA
2920 East Ave. So., Suite 200
La Crosse, Wisconsin 54601
800-444-3982 x 202
608-788-3965 FAX
Email: sklinski@orthopt.org

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Editor's Message

The Power of One—Collectively

In recent editorials, I have written about advocacy for physical therapy. I've talked about involvement in local politics, as all politics are local. I've talked about establishing relationships with legislators at both the state and federal level. I've talked about how one person can make a connection and provide information about physical therapy-related issues. And in the end, that one person can make a difference. The power of one!

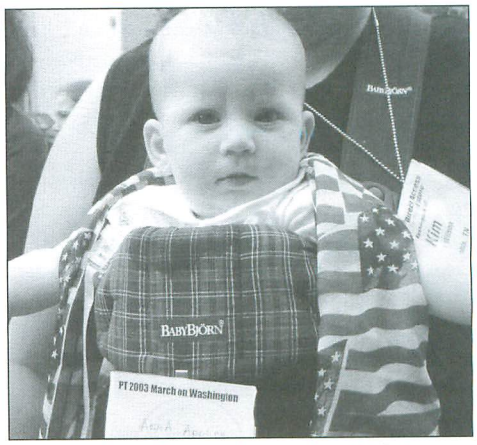
Well, the power of one—collectively—was very evident in Washington, D.C. on June 19, 2003. More than 2000 supporters of physical therapy marched on the Nation's capitol in support of Direct Access for Medicare (S 493/HR 792) and Repeal of the Medicare Cap (HR 1125/S 569). These persons included physical therapists, physical therapist assistants, PT and PTA students, and friends. About 1000 persons visited their senators and congressmen after the rally. Even my 6-month old daughter participated in both the rally and the visits to our legislators! She was our secret weapon when visiting Tennessee legislators.

As of July 7, there are a total of 104 cosponsors for HR 792, the Direct Access bill, with 22 being new sponsors since the rally. For the Direct Access bill in the Senate, S 493, we have 12 cosponsors, with 1 new since the rally. For repeal of the therapy cap, HR 1125 has 205 cosponsors, with 20 joining since June 19th. The Senate bill, S 569, has 42 cosponsors, with 1 additional sponsor since the rally. One of our goals on rally day was to get 100 sponsors for Direct Access. That goal was exceeded! Recently, the Medicare modernization and prescription drug legislation was adopted by both the House and Senate. The House bill had a measure on the therapy cap, while the Senate bill included a provision for a demonstration project for direct access. The Conference Committee must now meet and agree on what is included in the final bill. What progress we've made! The power of one—collectively.

I wish you all could have experienced the excitement on the Hill on June 19th. It was a day to be remembered by all PTs and PTAs. Our results show that we each have an impact on our legislators and that those legislators really do listen to their constituents. To experience a little piece of that excitement, go to the APTA website and access a video clip from the rally. You can find the clip at: www.apta.org/meetings/past_events/pt2003/news_pt2003/june20. Watching the clip gave me chill bumps again! It truly was a day to be remembered.

The power of one is an important concept, not just related to advocacy efforts with legislators, but also related to our patients/clients. Each of us has the power to impact the lives of others. We do it on a regular basis with our patients/clients. We help to change their lives. This issue of *OP* is focused on backpack use and safety. A number of the articles presented are examples of the power of one (or two) physical therapists who intervened in their children's schools and classroom. These authors have made a difference in these classrooms and are sharing their approaches and research with us today. Many thanks to the authors and to Mary Ann Wilmarth, Guest Editor for this issue, for providing us with clinically relevant and useful information. Mary Ann originally came up with the idea for this issue of *OP* and recruited the authors. We agreed that publication in August would be particularly helpful, as this was back-to-school time for most everyone. We hope you enjoy this issue and are able to use the information presented in your daily practice.

Susan A. Appling, PT, MS, OCS
Editor, OP



Anna Appling, adorned with stars and stripes, participates in the PT March on Washington, June 19, 2003.

Guest Editorial

I am very excited to be a part of this special backpack issue of *Orthopaedic Practice*. With teaching, raising children, observing the dramatic changes in backpacks and use over the years, and my continued interest in posture, I have developed a keen awareness of backpacks and the possible effects they might have on posture. I want to thank Susan Appling for allowing me to be a Guest Editor for this special backpack issue.

I was fortunate enough to gather together a very diverse group of authors from all corners of the United States as well as Australia. This includes experts in the field of physical therapy, professors, private practitioners, and students, as well as a leader in the field of occupational therapy. The backgrounds and special interests of the authors vary from biomechanics and motion analysis to pediatrics and orthopaedics.

Karen Grimmer, PhD, MMedSc, B Appl Sc.(Phys), LMusA, Cert Health Ec is a professor at the Centre for Allied Health Research at the University of South Australia. Her name and work are always in the forefront when one speaks of backpack issues. Dr. Grimmer and Emily Steele, B Appl Sc (Phys) describe their health promotion program that encourages good adolescent spinal health. Shelley A. Goodgold, PT, ScD is a professor with the Graduate Program in Physical Therapy at Simmons College in Boston and discusses her backpack safety program, *Backpack Intelligence*, which is a school-based injury and prevention and wellness promotion program. Kimberly A. Wesdock, PT, MS, PCS is a pediatric specialist in Virginia, who in conjunction with Martin Dominguez, PT, CFMT, has looked at the impact of backpack use on musculoskeletal pain. They are using evidence from their research in implementing their *Backpack Awareness Campaign* (BAC).

My colleague, Timothy S. Hilliard, PhD, and I have also gathered data on postural changes following backpack loading as part of the complex scenario of backpack use and evidence-based practice. Christine T. San Agustin, MSPT, CSCS and Jonathan Raymond, MSPT are two recent graduates who worked with us as students assessing students regarding the above-mentioned variations. Marilyn Miller von Foerster, PT, MA is in private practice in Oregon. She works with individuals as well as with schools regarding the whole backpack issue that is near and dear to her heart. She works from the center out keeping in mind that form follows function, always evaluating each individual as a whole.

And last, but certainly not least, Karen Jacobs, EdD, CPE, OTR/L, FAOTA is a professor of occupational therapy at Boston University's Sargent College of Health and Rehabilitation Sciences. She tells us about the Occupational Therapy National Awareness Campaign to promote health in student backpack users. The National Occupational Therapy Association has been working closely with L.L. Bean in Freeport, Maine to raise awareness about safe and healthy school backpack use.

Regardless of who is authoring an article, one thing appears to be consistently true, backpack or bag carriage and posture have a complex multifactorial relationship. Whether it is the craniovertebral angle or forward lean or back pain or type of backpack or weight, the interaction of these factors is key in the area of study involving backpack use.

In 2003 a study by Wiersema and colleagues[1] looked at musculoskeletal pain associated with emergency room visits. The results of this study point to the fact that children are more likely to hurt themselves tripping over a backpack than they are to suffer musculoskeletal injuries while wearing a backpack. However, when back injuries were reported, the majority of such injuries were in fact related to carrying the backpack. I would use caution when interpreting this study. The major issue with backpack use is not one of acute injuries as would be seen in an emergency room, but rather injuries that are more chronic in nature. That being said, we are more likely to see musculoskeletal injuries that are chronic in nature with patients being seen in pediatric or family practice medical offices. There is a need for further research in this area, especially with regards to the long-term effects of backpack or bag use.

There are many issues to be discussed and researched further, particularly longitudinal studies. As with all research there are times when more questions are raised than are answered. An example of this would be possible gender differences that surface with some of these studies. Will we be discussing "Venus and Mars Wear Backpacks" in the not-too-distant future?

The debate about what type of backpack to use continues as well. Dr. Grimmer's research has led to the development of an ergonomic backpack and more companies are seeing the need for stringent guidelines for designing and manufacturing backpacks. There is also the debate surrounding standard versus rolling backpacks. One issue with rolling backpacks can be the extra weight that is significant if students have to carry the backpack up and down stairs frequently during the day. The Lower School Division Head at The Pike School spoke to me about her concern with younger children not only tripping over rolling backpacks, but their use as potential rolling toys or weapons for knocking down other fellow students. Bags with wheels are great in places such as airports, but how practical are they in most schools with many stairs and limited space?

Although numerous questions remain regarding backpack use, I believe that you will find many solutions within the pages of this magazine. I want to express my sincere gratitude to those authors who contributed to this special issue of *Orthopaedic Physical Therapy Practice*, and I also look forward to continued dialogues and research surrounding the optimal use of backpacks.

REFERENCE

1. Wiersema BM, Wall EJ, Foad SL. Acute backpack injuries in children. *Pediatrics.* 2003;11:163-166.

Enjoy your reading!

Mary Ann Wilmarth, PT, DPT, MS, OCS, MTC, Cert MDT

Mary Ann Wilmarth is assistant clinical specialist, Department of Physical Therapy at Northeastern University in Boston and also is our current Home Study Course Editor for the Orthopaedic Section.

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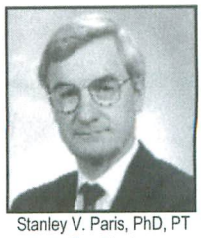

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Chicago, IL	Paris	Sep 13
Midland, MI	Paris	Sep 16
Detroit, MI	Paris	Sep 18
Cleveland, OH	Paris	Sep 20
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Ortho 7/03

President's Message

Synergy in Action

Whenever I teach a course involving muscular action, I always try to review how muscle and connective tissue work together in synergy. Before I went to PT school, I somehow had this simplistic belief that muscle and tendon were two very separate structures; Figure 1 is my crude rendition of what I used to think. Being out in clinical practice, most of my patients also think muscle and tendon look this way. Later, after learning muscle and connective tissue histology and physiology, I found out why muscle is referred to as a musculotendinous unit. Connective tissue is firmly imbedded into bone by Sharpey's fibers, ever deeper and deeper as bone hypetrophies and its circumference increases, and thus forms the deep roots of tendon. As tendon comes out of bone it eventually diverges and forms the 3 continuous layers of connective tissue surrounding muscle: the epimysium, paramysium, and endomysium. Thus the outer layers of tendon forms the epimysium, the inner portion of the tendon forms the endomysium, while the paramysium is made up of the middle layer or zone. On the opposite end, the 3 connective tissue coverings converge to again form the tendon and then back into bone via the Sharpey's fibers. Therefore, muscle becomes fully enveloped and surrounded by its associated connective tissue. Muscle, owing to its intimate relationship located within its connective tissue covering, easily and efficiently imparts its contractile force on bone. Thus, muscle and connective tissue work in complete harmony or synergy, even though they are derived from much different types of tissues.

APTA works a lot like a musculotendinous unit. Consider epimysium is APTA, paramysium the components (Chapters and Sections), and endomysium, (district or special interest groups), while muscle itself is our individual membership. Thus, epimysium covering the entire muscle provides balance and structure as well as boundary and unification to the whole muscle. Without epimysium, muscle would have no form, no direction, and no cohesive unity. APTA also gives balance, structure, and unification in a similar way. Paramysium bundles muscle and keeps it in well-defined groups, allowing the groups to work efficiently for the overall good of muscle, no matter its location (gastroc or soleus; East coast or West coast), size (long or short head of the biceps femoris; Alaska or Rhode Island chapter), or type (fast gylcolytic or slow oxidative; Orthopaedic Section or Section on Geriatrics). Similarly our Chapters and Sections provide a group forum that benefits the membership as a whole. Endomysium, the smallest unit, is where muscle (members) collectively work or contribute for the good of the whole muscle. Likewise our members make up the smallest functioning unit but carry out the work of the Association. Muscle either hypertrophies or atrophies, much like our members. Muscles that hypertrophy contribute much to the function of the body, while muscles that atrophy contribute little to the proper function of the body. Each muscle exerts its influence individually but acts strongest when working as a group or as a whole muscle. Thus, as members of a group we must exercise in such a way that we encourage all muscle fibers hypertrophy. As muscle becomes stronger so does all portions of connective tissues including the epimysium, paramysium, endomysium, and tendon. Thus, muscle cannot hypertrophy without also providing a growing influence on its associated connective tissue. Thus when we work hard individually, the action of muscle and connective tissue is enhanced. The comparison of muscle to APTA is simple but I think very fitting, as a group we are strongest! As an integral member of an association, like muscle, we must continue to exercise regularly and enthusiastically and contribute to the group's effort.

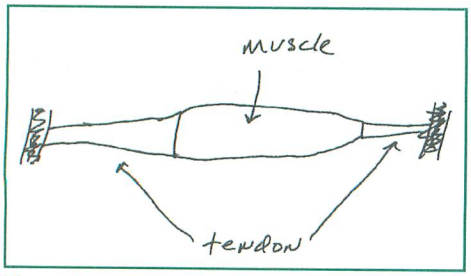

Figure 1.

Synergy, as I just described one example, is important throughout our body. Just getting back from APTA's Annual Conference and Exposition, I got to see another great example of our synergy in action. More than 2,000 physical therapists gathered in our Nation's capitol to try to achieve Medicare Direct Access and eliminate the capricious Medicare Cap. Orthopaedic, pediatric, neurological, manual manipulative, health policy, research, sports, geriatric, Texan, Missourian, New Yorker—whatever we may call ourselves—we came with alacrity. No matter where skeletal muscle is located (inner, middle, outer portion), it still transmits its force to connective tissue. In such a manner, we physical therapists as members of an Association acted as one big muscle in an effort to influence Congress regarding Medicare direct access and to eliminate the Medicare Cap. The halls of the Senate and House office buildings were buzzing with PTs doing their best to convince Congress that the Medicare Cap is capricious and that Medicare Direct Access will save, not cost money. As physical therapists on Capitol Hill, we worked synergistically and enthusiastically together as one big motor unit.

Despite our enthusiasm we all knew that both of these bills were going to be difficult to get passed in this Congress. A story I heard most was "how can we give you any money, surely you know that we are discussing right now putting in a $40 billion Medicare bill that would give Medicare recipients much needed help with payment on medications?" Our response, if we intervened earlier we could save money that would normally be spent on drugs. As we know anti-inflammatory drugs are one of the most commonly used medications by our geriatric population. Reducing the need for medications through an early, well thought out, rational evaluation and intervention by a physical therapist would undoubtedly reduce overall drug costs significantly. We emphasized the importance of early diagnosis and suggested that early diagnosis often leads to an effective treatment. Hopefully, Congress was listening. We will continue

this fight until these 2 bills pass. I also know the Orthopaedic Section will continue to support research that will provide data to show the importance of physical therapy intervention. No matter what our contribution is, research, political, leadership, or just a "worker bee," we all must work in synergy to show Congress that the time is now for direct access. Before leaving this issue I would like to express much gratitude to all of those Orthopaedic Section members who joined the fight and donated a full day (and it was a full day starting at 7 am and done around 5 pm) of hard, hot, and humid work for the future of physical therapy in Washington DC in June. Our Editor of *OP*, Susan Appling was seen marching in tow with her little one down the busy house corridors; now that's dedication to one's profession. Our national association, the American Physical Therapy Association, provides the guiding synergy that unites us and keeps us connected in advancing our profession forward. Synergy means working together.

I am happy to honor the many Orthopaedic Section members who recently received awards at APTA's Annual Conference and Exposition. These special, synergy-minded, muscled members were honored for their leadership, for advancing the profession, and for contributing their time and talent to our professional organization. Please see the complete list of our Section Members in the News found on page 10.

Finally I ask you to ponder these questions about your professional life. How will you make your mark on this world? What is your contribution to physical therapy? How will history remember you? Have you used your talents to make your profession great or do you use it for your own personal gain? Exercise your options!! Remember success without contribution is inconsequential!!

Orthopaedically yours,
Michael T. Cibulka, PT, MHS, OCS
President

Section Members in the News

Association leaders, PTs, and PTAs gathered at the Annual Conference recognition ceremony to honor and thank their colleagues for their contributions and commitment to practice, research, and education. Congratulations to the following Orthopaedic Section members with Honors and Awards Bestowed:

HONORS

New Catherine Worthingham Fellows of the American Physical Therapy Association:

Barbara A. Melzer, PT, PhD, FAPTA

Lynn Snyder-Mackler, PT, ScD, SCS, FAPTA

AWARDS FOR SERVICE

Lucy Blair Service Awards:

Pamela A. Duffy, PT, MEd, OCS, RP

Suzanne Robben Brown, PT, MPH

Rodney A. Miyasaki, PT, MA

AWARDS FOR RESEARCH

Eugene Michaels New Investigator Award:

Ann E. Barr, PT, PhD

AWARDS FOR PUBLICATION

Dorothy Briggs Memorial Scientific Inquiry Awards:

Rosemary Blau, PT, MSPT

Elizabeth Nash Dudley, PT, DPT

Helen J Hislop Award for Outstanding Contributions to Professional Literature:

David E. Krebs, PT, DPT, PhD

Jack Walker Award:

Julie M. Fritz, PT, PhD, ATC

Steven Z. George, PT, PhD

AWARDS FOR EDUCATION

Dorothy E Baethke-Eleanor J Carlin Award for Excellence in Academic Teaching:

Guy G. Simoneau, PT, PhD

Minority Scholarship Awards for Academic Excellence:

Annie On Yee Chung—physical therapist professional education student

Congratulations also to those Orthopaedic Section members who were elected to APTA positions:

Janet R. Bezner, PT, PhD

Karl R. Gibson, PT, MS

Janet M. Peterson, PT, MA

John G. Wallace, Jr., PT, MS

Barbara A. Melzer, PT, PhD

CONGRATULATIONS!!!

Good Adolescent Spinal Health - Ensuring Healthy Adolescence and Adulthood

Karen Grimmer, PhD MMed Sc B, Appl Sc (Phys) LMusA, Cert Health Ec, Emily Steele, B Appl Sc (Phys)

INTRODUCTION

Spinal pain is one of the most costly and disabling problems affecting adults in industrialized countries.[1-3] Population-based surveys of adult spinal pain variably report a point prevalence of 15% to 30%, a 1-year prevalence of 50%, and a lifetime prevalence of 60% to 80%,[4-6] which is concerning in terms of loss of productivity, health care costs, and personal pain and suffering. There is some evidence to suggest that spinal pain experienced in adolescence is a risk factor for spinal pain in later life,[7,8] although there are scarce longitudinal studies to support this. However it is plausible that protecting the spinal health of adolescents could reduce future societal burden of adult spinal pain. In order to do this successfully, it is first necessary to understand the contributing factors to spinal pain in adolescents, and second, to introduce successful preventative strategies that reduce the presence, or impact, of these contributing factors. This paper briefly reports on our findings to date regarding spinal health risk factors, and outlines our work in developing prevention strategies (health policy and health promotion program), to address these factors within the school environment.

Our work could not have proceeded without the unique partnership that we (health researchers) have developed with the education sector (The Department of Education and Children's Services in South Australia). This partnership has allowed us to take a long-term collaborative approach to the development of background knowledge and implementation strategies, and in our actual interventions into the school environment. To our knowledge, these are the first spinal care interventions for school students that are based on sound research and a commitment from both the health and education sectors.

OUR RESEARCH

Adolescents have been repeatedly identified around the world as suffering from spinal pain.[9-16] The repetitive carriage of heavy loads, the poor ergonomic fit of school furniture, and the repetitive poor study postures adopted have been hypothesized as potential causes of adolescent spinal pain.[12,14] Our research has consisted of a number of approaches: pilot work, population-based research (cross-sectional and longitudinal studies), and experimental and laboratory studies. This work aimed to identify correlates of spinal pain in adolescents.

Pilot Studies

The valid, reliable measurement of posture was our key concern to ensure the success of our research into the stresses of load carriage on adolescent spinal posture. We validated the use of two-dimensional photography of adolescents in standing (using digitization of anatomical points on head, neck, shoulder, hip, thigh, knee, and ankle) as a way of reliably describing changes to posture when carrying posterior loads.[17]

Population-based Studies

In 1998 we completed a cross-sectional study on approximately 1300 adolescents (aged 12-18 years) from 12 metropolitan South Australian high schools (reflecting 5 high school year levels).[18-23] We found that approximately 50% of adolescents repeatedly reported a recent event of spinal pain (neck or low back). Our research identified strong associates of adolescent low back pain, particularly for young people in the rapid spinal growth years (12-14 years for girls and 13-16 years for boys), as repeatedly carrying school backpacks weighing over 3 kg, more than 5 hours of sitting (outside school hours), having very tall children or short children sitting for any length of time in 'usual' school furniture, having an abnormal trunk height to leg length ratio (during growth spurts for boys), and playing high level sports for more than 8 hours per week (for 12-14 year old boys and girls).[18-23] While some of these contributing factors are not amenable to change (trunk height to leg length ratio), the effect of others may be reduced through changes in the students' behavior (eg, hours spent sitting outside of school day), or to the school environment (eg, availability of different sized school furniture in the classroom).

Keen to validate the cross-sectional study findings, we embarked on a longitudinal study in 1999, repeatedly testing a cohort of adolescents entering their first year of high school in 1999 up until they completed high school in 2003. Preliminary analysis of the data suggests that our cross-sectional study findings were an accurate reflection of risk factors for low back and neck pain in adolescents. We are particularly concerned with evidence of an increase in incidence of spinal pain with age, and with increases in poor posture as students' age. We are currently testing the longitudinal data for hypotheses regarding posture, pain, poor muscle endurance and strength, poor motor control, changes in anthropometry, and times spent sitting per day.

Experimental and Laboratory Studies

We conducted a series of experimental and laboratory studies designed to explore the effect on adolescent spinal posture of carrying posterior (backpack) loads.[24] We found the most useful way of interpreting the effect of posterior load was to report it as a percentage of body weight. The underlying aim of these investigations was to identify critical 'safe' loads that could be carried in school backpacks, and to describe the effect on posture of the position of the load on the spine. Our findings suggest that carrying a school backpack centered around the waist level incurs least postural adjustment; however, we are yet to recommend a critical load carrying limit.[24]

Backpack Development

The results of our research have lead to the development of an ergonomic backpack (PhysioPak) manufactured by Spartan School Supplies (www.physiopak.com).

INTERVENTIONS FOR ADOLESCENT SPINAL PAIN

As a result of our extensive involvement in school communities in conducting our research to date, we have constructed a view that adolescent spinal pain and its' contributing factors are multifactorial in nature, with both student behaviors and the school environment contributing (as mentioned previously), along with input from other stakeholders who need to be considered when attempting to intervene to improve the

problem. We believe that a key reason for ongoing concerns world-wide regarding adolescent spinal health is the lack of recognition and ownership of the problem, reflecting the variable involvement of different government sectors (health, education, workplace injury management), leaders of school communities, the student peer group, and families of students. Adolescents seem relatively powerless to make sustainable decisions regarding their spinal health, as they have limited input on the purchase and design of school or home furniture, the design and performance of recommended school backpacks, the choice of school textbooks, school timetables and homework requirements, and the use of computers at school and home. Therefore undertaking interventions that target adolescents alone would appear to be unlikely to succeed. Thus, any school-based intervention aiming to decrease the prevalence of spinal pain in school students should:

- address multifactorial risk factors (student behavior, school environment, influence of stakeholders),
- be 'owned' and promoted by key adults within that environment, and
- encourage the school community as a whole to adopt a culture of adolescent spinal health promotion.

Based on these factors, and our findings of spinal pain prevalence and its potential risk factors, in 2000 we designed two school-based, public health interventions. Both interventions aim to address spinal health risk factors that are potentially amenable to change. Underpinning this work is the NH&MRC 'Effective school health promotion: towards health promoting schools' document (1996),[25] which aims to:

- provide advice to Australian State and Commonwealth Health Ministers and their departments on the best approaches to health promotion in schools and
- make clear recommendations concerning the types of investments likely to lead to measurable health outcomes.

The remainder of this paper describes our 2 intervention strategies: the spinal health for school students' policy and the spinal health promotion program.

1. Spinal Health for Students' Policy

It is important that adolescents are protected from situations that may produce injury, in the same way as adults are protected from workplace injury by legislation. While adolescents spend the majority of their 'work' time at school, there are few legislative or workplace standards specifically in place in schools to protect adolescents from 'work-related' injury, and in particular, no formal approaches to decrease the risk of injury to students' spines. Ironically, teachers (adults) are protected from injuries in the same workplace (the school) by legislation. Therefore, in conjunction with the South Australian Department of Education and Children's Services (DECS) (formerly the Department of Education, Training, and Employment), we constructed a spinal health policy based on findings of our research. The policy was formally launched in Adelaide, South Australia in October 2002 by the Minister for Education and Children's Services, and represents the position of the South Australian State Government with respect to promoting good spinal health of adolescent school students (http://www.decs.sa.gov.au/deptinit). The policy advocates awareness of good spinal health within the school community, and promotes it as an issue that needs to be owned by all (teachers, parents, students). It makes practical suggestions to improve individual student knowledge, attitudes, and behaviors, as well as improvements to the school environment (such as the location of lockers with respect to classrooms). Schools across South Australia have been encouraged to use the document to underpin their school occupational health and safety activities, to recognize risks to students' spinal health within their environment, and to take practical steps to address these risks. The uptake of this policy will be tested by questionnaire of a sample of South Australian schools at the first anniversary of its launch (end 2003). The first 2 pages of the policy document are reproduced in Figure 1. The remainder of the policy can be found on the website listed above.

2. Spinal Health Promotion Program

Our second approach to the prevention of spinal pain in adolescents has been to develop, in conjunction with DECS, a unique health promotion program that uses the Health Promoting Schools model.[26] The underlying philosophy behind health promotion in schools is that a comprehensive program, rather than curriculum alone, is required to encourage children to adopt health-enhancing behaviors.[27,28] Therefore our program also targets parents and the school community as secondary target groups, through literature and involvement in education sessions, and encourages school-wide adoption of our spinal health for students policy (discussed above).

The health promotion program aims to increase awareness of adolescent spinal health, and good spinal health behaviors in all target groups. The backbone of the program is a formal curriculum, written by a recognized curriculum design expert in conjunction with our research team, using the guidelines provided by DECS and the South Australian Curriculum, Standards and Accountability (SACSA) Framework. The curriculum was written for students entering the first year of high school (aged 12-13 years), since this is the age of the largest adolescent growth spurt when the spine is at its' most vulnerable to injury.[29] The curriculum sets out a framework of teaching/learning modules that incorporate the findings of our research in the context of 5 core learning areas (English, Mathematics, Health and Physical Education, Society and the Environment, and Science). Teaching and learning activities in the curriculum include:

- *English*—students develop a survey instrument and apply it to teachers and peers to determine others' attitudes to load carrying, understanding of spinal health issues, and perceptions of good and poor postures;
- *Mathematics and Science*—school bags are weighed daily for a week, and basic mathematical calculations are undertaken of load and percentage of body weight. The forces and postures produced by different load carrying postures are assessed, and differences in spinal performance between young people of different sizes and shapes identified;
- *Society and Environment*—societal issues of good spinal health, pain, posture, work environments and workplace injury are investigated, allowing young people to reflect on their own spinal health choices, those of their peers, and the adults with whom they interact;
- *Physical Education*—students and teacher develop good spinal health strategies for everyday activities (such as exercise behaviors, posture, furniture choices, and use).

Preliminary content validation of the curriculum and wider health promotion program has already been undertaken by curriculum experts within DECS, school health promotion experts, and teachers and parents at metropolitan high schools in South Australia. In May 2003, a pilot study of the curriculum in the context of the wider school health promotion began and will be evaluated at one South

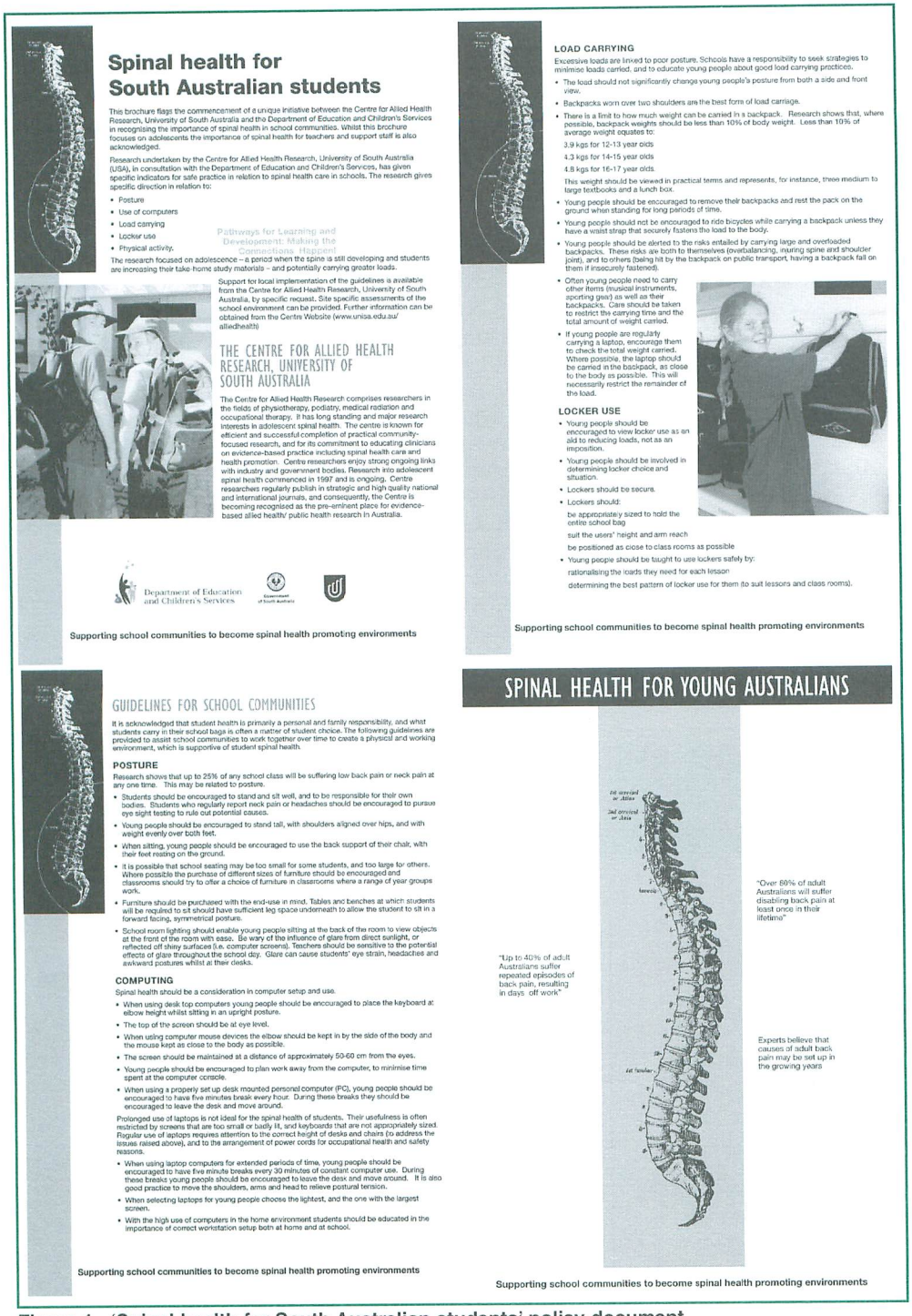

Figure 1. 'Spinal health for South Australian students' policy document.

Australian high school. By the end of 2003 we aim to have a validated, ready-to-use spinal health promotion package that will be evaluated in a wide-range of schools of varying geographical and socioeconomic locations, to produce a generic (flexible) package capable of being applied to all schools in the developed world, in the context of their local environments.

CONCLUSION

Spinal pain in adolescence should be a concern to health practitioners and educators due to high prevalence rates, and the potential for it to be associated with adult back pain, with all its consequences. While there is world-wide recognition of the problem of adolescent spinal pain, few groups world-wide seem to have progressed beyond the stage of 'describing the problem.' The multifactorial nature of spinal pain, and the multiple stakeholders in the issue of adolescent spinal pain, mean that to make a sustainable difference requires strong intersectorial partnerships that support multiple intervention strategies that are based on sound research, and target different aspects of the problem.

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ORTHOPAEDIC SECTION RESTATED BYLAW VOTE

The restated bylaws have been adopted by the membership making them effective immediately. Thanks to all of you who took the time to vote on this very important governance document. Your participation is greatly appreciated.

Backpack Intelligence: Implementation of a Backpack Safety Program with Fifth Grade Students

Shelley A. Goodgold, PT, ScD

INTRODUCTION

Backpack use by children is a prominent school health issue in the United States and other Western countries. Many children are carrying heavy backpack loads that proportionally exceed legal occupational limits established for adults.[1-4] Although the link between backpack use and injury has not been definitively established, the incidence of pediatric back pain is approaching rates seen in adults.[5] This translates into a pediatric public health concern since a history of back pain is a predictor of future episodes, and adults with back problems experience high medical costs, lost wages, and personal suffering.[6-8]

Over the past 5 years, there has been a plethora of media coverage on the potentially harmful effects of backpack use by children. This has heightened parental concerns, which in turn has precipitated the formation of school backpack committees and requests to school administrators for action. Legislators in the United States also have been moved into action, and several states, following California's lead, are proposing laws limiting backpack loads.

Schools are an optimal environment for addressing pediatric public health issues, and it is appropriate for physical therapists to take a leadership role in this arena. Physical therapists have the unique educational background to evaluate postural alignment, musculoskeletal dysfunction, and risk of injury as well as teach injury prevention and wellness educational programs for children and adolescents. Therefore, the purpose of this article is to describe a backpack educational program and its implementation with a class of fifth grade students.

Backpack Intelligence CONTENT

Backpack Intelligence is an injury prevention educational program, developed by the author who is a licensed physical therapist, educator, and researcher with 30 years of pediatric experience. Its content is based on pertinent research literature on the effects of backpack use,[9-27] theories of behavior change,[28-31] and learning.[32-34] *Backpack Intelligence* consists of 3 areas of student education: (1) recognition when a backpack is too heavy, (2) identification of desirable backpack features, and (3) instruction in the proper way to wear and pack a backpack. It is adapted to the developmental level of the students and revised regularly to reflect new research elucidating the effects of school-related backpack use.

The educational program can be implemented in one or more educational sessions, and can be integrated into the physical education or health education curriculum. Another option is to integrate the programming into the math or science curriculums by incorporating calculation of percent body weight (the percent the backpack weighs in relation to the weight of the child), work or energy expenditure, statistical analyses, and graphing into existing learning modules.

Facilitating substantive and long-lasting changes in behavior is challenging. Students need to believe that there is a risk of serious injury, have the knowledge and the resources to reduce that risk, and believe that changes in their behavior will make a difference.[28-31] The school and home environment also need to support and supplement these changes. Physical therapists, therefore, need to work cooperatively with school officials and parents. For success, the *Backpack Intelligence* program needs to be integrated with school infrastructure policies and active support from teachers and parents.

Recognizing When Your Backpack is Too Heavy

Since experts do not agree on a maximum safe backpack weight for children to carry and percent body weight does not take into account the child's height, body fat, or muscle strength, the *Backpack Intelligence* program teaches children to recognize warning signs that their backpack is too heavy. Five warning signs are presented that reflect difficulty handling the backpack load. These include: (1) struggling to put on or take off the backpack, (2) pain when wearing the backpack, (3) tingling or numbness, (4) red marks, and (5) noticeable changes in posture. Within this module, basic body and backpack biomechanics are explained through discussion, demonstration, and handouts. Students learn how postural changes are compensatory mechanisms for changes in their center of gravity and how a heavy backpack load may cause postural malalignment, muscle fatigue, and impaired shock absorption leading to increased risk of injury.[12-14,22-27] In addition, students are taught how the combination of a too heavy backpack and shoulder straps that are too wide or not contoured can cause compression to the brachial plexus, resulting in upper extremity tingling or numbness.[11]

Choosing Desirable Backpack Features

Most backpack companies have a variety of backpack models developed for school use, each with different features for enhanced safety and comfort. Children are taught to match the size of their backpack to the length of their torso, and that backpack shoulder straps need to allow free arm movement. Since it is tempting to fill backpacks to their full capacity, students are cautioned about backpacks with extra large capacity.

Desirable backpack features are displayed using a backpack that has all of the recommended features. A padded back is recommended to reduce pressure on the back and enhance comfort. Two contoured and padded shoulder straps reduce pressure on the shoulders, and permit free movement of the arms. While the one-strap diagonal shoulder bag is not problematic when the load is light, 2 straps are required when the backpack is heavier to distribute the weight more broadly and promote symmetrical posture. Hip and chest belts, rarely worn by children or adolescents outside of hiking, are highly recommended when the load is heavy because they transfer part of the backpack weight from the back and shoulders to the hips and torso. Multiple compartments not only enhance access to the contents, but they better distribute the weight in the backpack, and keep items secure. A key feature, not standard on backpacks, is compression straps. These are cinch straps that compress and stabilize the contents, and thereby shift the load as close to the back as possible.

Students are also warned not to hang items from the back of the backpack, since items have become caught in doors and escalators, causing serious injuries. Another safety feature is reflective material to enhance visibility of the students to drivers at night. Also, for wheeled backpack use, it is important that the wheels pivot 360° for safe turning and that they are sufficiently large so that the backpack does not topple. For tall adolescents, the handle needs to extend sufficiently to prevent trunk flexion and rotation, a position in which the back is particularly vulnerable to injury.[6] Last, students are cautioned that a wheeled backpack is heavier than a canvas one, so it is not desirable if the student will often need to lift and carry the backpack on stairs or narrow areas like bus aisles.

Wearing & Packing Your Backpack Properly

To enhance postural symmetry and distribute weight of the backpack evenly, students are taught to use both shoulder straps and wear the backpack close to the back.[1,2,4,6,9,10,12,26] As stated previously, hip and/or chest belts are recommended to transfer part of the weight of the backpack from the back and shoulders to the hips and or chest. This also makes the backpack more stable. Since a flexed and rotated posture has been associated with the highest incidence of adult occupational back injury,[6] proper lifting and lowering of the backpack during donning and doffing should be included in the program.

Many children in the United States prefer to wear their backpack very low on their torso. It is easier to don and doff the backpack when the shoulder straps are in this lengthened position, and weight felt over the back is reduced. One recent study reported that trunk forward flexion was reduced when the backpack was worn in a lower position compared with a high placement near C7.[17] The dependent measure was posture during standing, with a maximal backpack weight of 10% body weight. This weight is below that typically worn by children in the United States,[13] and it has been shown that trunk forward flexion is a nondose dependent, compensatory strategy.[12,14] Therefore, posture alone should not be used to judge safe load limit. Also, research is needed to examine if the low backpack position places increased stress on low back musculature or shoulders, or if the backpack is less stable when the child walks or runs.

Until definitive research is available, the *Backpack Intelligence* program encourages students to raise their backpack to a more stable, mid-back position with both shoulder straps to distribute the weight evenly. A 'see-saw' example is used as an analogy to help students understand the dynamics. Students are asked to recall when they played on a see-saw. The same physics that affected their ability to lift the other child by moving backwards on the board is at work when a backpack is worn. In addition, when packing the backpack, students are instructed to place the heaviest items closest to the back.[1,2,4] This moves the weight of the backpack closer to the child's base of support. Last, students are advised to limit the backpack weight to what they can carry comfortably.[20,24,25]

IMPLEMENTATION

Concerned about backpack safety, a fifth grade teacher from a Massachusetts suburban public elementary school contacted the author and requested that her class participate in the program. This was approved by the teacher's school principal and the town's superintendent. Twenty-two 5th grade students, consisting of 15 boys and 7 girls ranging in age from 10.5 to 11.5 years, participated in the *Backpack Intelligence* program. All children volunteered to participate in the class, and had signed consent forms from their parents to be photographed and videotaped during the session.

Students actively participated in their *Backpack Intelligence* session by completing worksheets on recognizing warning signs that the backpack is too heavy, desirable backpack features, and how to wear and pack a backpack (Appendix 1). To enhance learning, the information was introduced to the children in a manner that made it fun, given their developmental age, and completion of the worksheet was interactive. Children actively participated by raising their hands based on their responses to the worksheet questions, demonstrating backpack use, and sharing personal experiences or problems encountered when using their backpacks. Students also weighed themselves with and without their backpack using standard analog scales. To integrate math into this experience, calculators were provided by the classroom teacher. Students were taught the formula for percent body weight, and assistance in calculating this score was provided as needed. To enhance reliability, scales were calibrated prior to the session. In addition, to assure privacy, the scales were placed strategically in the room and only one student was allowed to weigh himself at a time. To enhance validity of the weight in the backpacks, the program was scheduled during the first period in the morning. As soon as students arrived at school, they were instructed to not unpack their backpacks.

After completing the worksheet, students tallied their answers, and used the *Backpack Intelligence* scoring guide to assess their knowledge (Appendix 2). Although only one student volunteer was requested, all of the students wanted to have 'before' and 'after' pictures taken, showing how they learned the correct way to use their backpacks. The photographs and key *Backpack Intelligence* content were organized into a poster using Microsoft PowerPoint. The poster was hung outside of the school's main office, and standard letter-size copies were distributed to the children to bring home to share with their parents. The class also was videotaped by the teacher, and aired on their local cable station.

Backpack Intelligence WORKSHEET RESULTS

Nearly three-quarters of the students, 73%, reported 3 or more warning signs that their backpack was too heavy (Figure 1). The 3 most frequently reported 'red flags' were changes in posture, pain, and red marks. While the majority of students had backpacks with multiple compartments (95%) and a padded back (82%), only 27% had compression straps. Also, only 50% of students had backpacks with contoured shoulder straps.

When asked how they used their backpack, most students reported to use both straps (Figure 2). However, few students reported use of hip or chest belts, and less than a quarter of the students reported to wear their backpack between the bottom of their neck and the curve of their low back. In addition, only a little more than half of the students reported to organize the articles with the heaviest items closet to their backs.

Mean backpack weight for the students on the day of the program was 15 pounds. In spite of the fact that all of the children have the same teacher and same homework assignments, there was a wide range in backpack weight from 3 pounds to 35 pounds. Two-fifths of the students, 41%, were carrying backpacks weighing greater than 15% of their body weight, the maximum weight limit recommended by many health professionals. It was troubling to find that at their young age, 6 of the 22 children had already sustained a back injury serious enough to require them to see a physician, miss school, or refrain from sports participation. Further, 5 of these 6 children, reported recurrence of the problem.

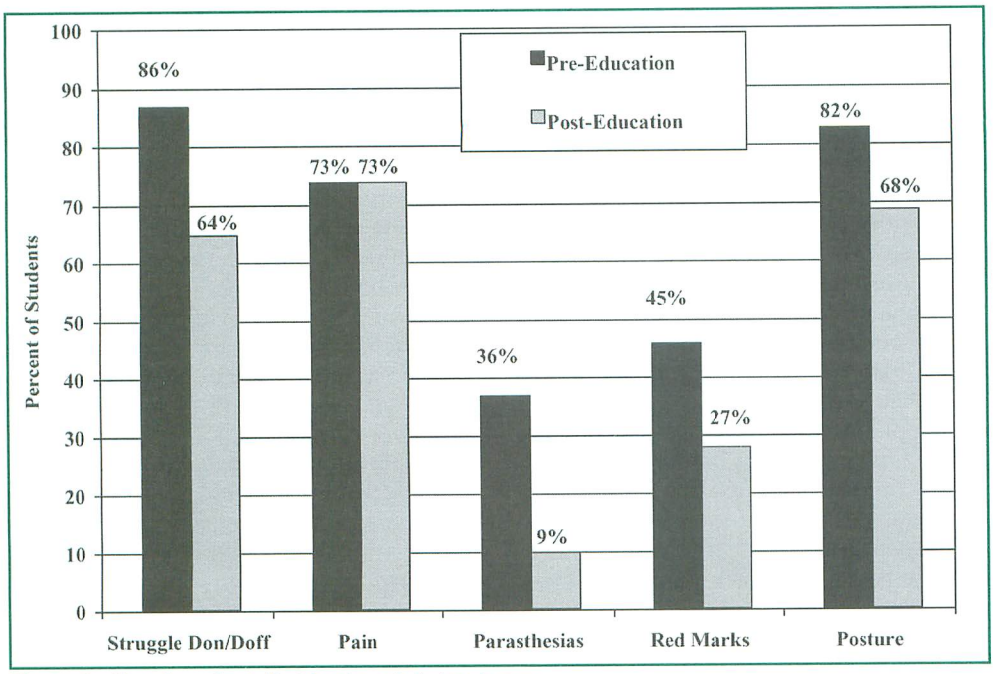

Figure 1. Warning signs that backpack is too heavy.

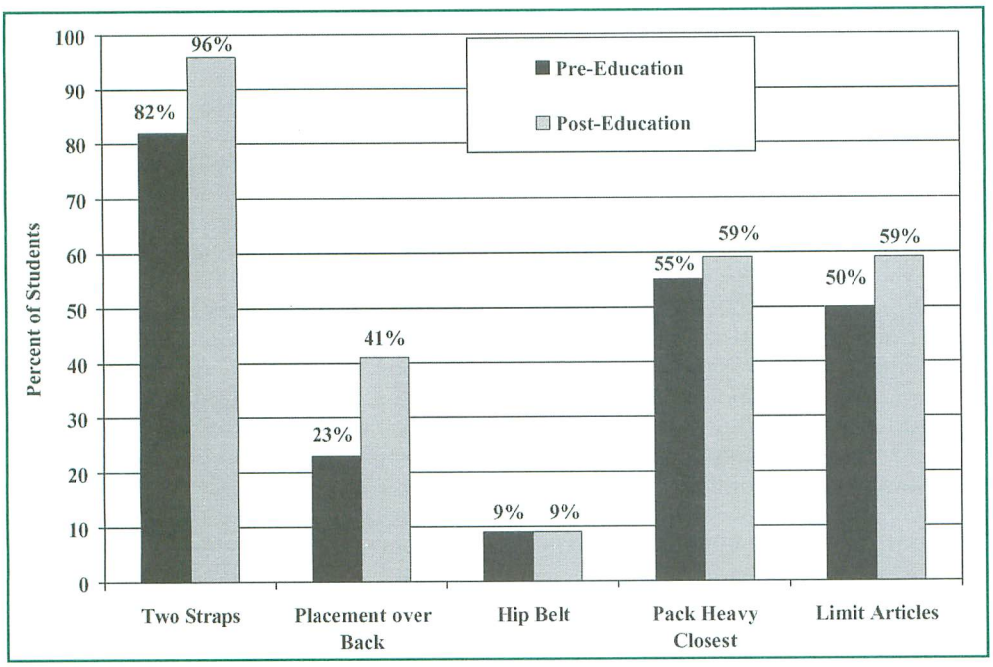

Figure 2. Backpack usage.

PROGRAM EVALUATION

To evaluate the effectiveness of the *Backpack Intelligence* program, students completed a post-education survey at school a few weeks later. The questionnaire included demographic information, current backpack usage, history of back pain and recurrence, self-reported knowledge of backpack safety, behavior changes as a result of the programming, and belief that improper backpack use can cause injury.

All of students reported to be knowledgeable about backpack safety post-education, an increase of 55%, and the majority, 77%, reported that they believed improper backpack use could cause injury. There also was a 23% reduction in the number of warning signs indicating that their backpacks were too heavy (Figure 1). Reductions were noted for every warning sign except for pain.

All but 2 students reported that they changed or planned to change the way they used their backpack as a result of the educational session. The 3 most commonly reported changes in behavior, in order of frequency, were lifted backpack higher or closer to back, packed heaviest items closest to back, and reduced backpack weight by prioritizing items carried. As seen in Figure 2, students improved in safe use of their backpack in every area except for use of a hip belt.

DISCUSSION

Research findings have revealed that school-aged children are carrying heavy backpack loads, that backpacks are uncomfortable to carry, and that the incidence of back problems in school-aged children is high.[13,25] Therefore, the purpose of this article was to describe a school-based backpack injury prevention program and its implementation in a fifth grade setting. Supporting the need for a backpack safety program, nearly three-quarters of the students reported 3 or more warning signs that their backpack was too heavy and about half of the students reported that they did not know how to safely use their backpacks.

Backpack Intelligence was well received by the students, teacher, principal, and parents. Many students gained knowledge, heeded advice, and changed their backpack behavior. All of the students felt knowledgeable about backpack safety post-education, and all but 2 students changed or planned to change how they used their backpack.

Backpack safety requires a broad health perspective. Substantive changes can not be expected to be long lasting through one isolated, educational session, and it is unsound to put the full burden of backpack safety on children. Institutional policies that support backpack safety need to be implemented, school staff need to value injury prevention and wellness promotion, health professionals need to be informed and involved, and for elementary school-aged children, parental involvement is a key component.

COLLABORATION WITH SCHOOLS AND PARENTS

Strategies that supplement *Backpack Intelligence* include a second set of textbooks for the classroom, reduction in daily supplies that children are required to carry, use of folders rather than binders, increased time for locker use at the middle and high school levels, and paperback rather than hardcover texts or texts in volumes. If volumes are used, costs for books can be further reduced by teachers within a grade alternating use of particular volumes. Availability of texts on CD is limited at this time, but in the future, this may be a viable strategy. Parents can further support backpack safety efforts by helping their children choose backpacks with desirable ergonomic features. In addition, parents can monitor proper packing of the backpack so that the heaviest items are closest to the back and items needed that day only are carried.

Some of the recommended strategies require additional funding and others require teacher flexibility and administrative support. School-based backpack health promotion interventions need to take into consideration the challenges faced by the school's principal and teachers. These include striving for academic excellence which often increases texts and supplies required for homework and decreases time for locker use. In addition, at the middle and high school levels, schools may lack a sufficient number of lockers due to overcrowding, or in some cities, lockers have been removed as a violence prevention strategy. Formation of a school backpack committee, teaming parents, school officials, and health professionals, provides an excellent forum for education and planning of backpack safety initiatives.

CONCLUSIONS

Physical therapists, in cooperation with school personnel and parents, are compelled to safeguard the health of our children and provide backpack safety programs. These programs should be based on the best research evidence available, designed using behavior change and learning theories, and adapted to the developmental age of the target audience. *Backpack Intelligence* is an example of a program that meets these criteria, and physical therapists are encouraged to assume leadership in school-based injury prevention and wellness promotion.

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Shelley A. Goodgold is an Associate Professor for the Graduate Program in Physical Therapy at Simmons College in Boston, MA.

Appendix 1. Backpack Intelligence Worksheet

Section A: How heavy is your backpack?

Check the box to answer "Yes."

- ❑ Do you struggle to put on or take off your backpack?
- ❑ Do you have back, neck or shoulder pain when you are wearing your backpack?
- ❑ Do you have tingling or numbness down your arm or hand?
- ❑ Do you get red marks on your shoulders from the backpack?
- ❑ Do you have to change your posture (lean forward or to the side) to keep your balance when you're wearing the backpack?

How many questions did you answer 'Yes"? _____

Section B: Which backpack features do you have?

Check the box to answer "Yes."

- ❑ Two contoured (curved) shoulder straps that allow your arms to move freely as you walk, and that are wide and padded to disperse the weight of the backpack across your shoulders.
- ❑ Padded back for comfort.
- ❑ Multiple compartments to better distribute the weight.
- ❑ Hip or chest belt to transfer the weight from your shoulders to your torso/hips, and to stabilize the backpack.
- ❑ Compression straps to secure and stabilize the articles in your backpack.
- ❑ Reflective stripping to enhance your visibility at night so drivers can see you.

How many features do you have? _____

Section C: How do you wear your backpack?

Check the box to answer "Yes."

- ❑ Do you always use both straps of your backpack?
- ❑ Does your backpack rest on your back, between your neck and the curve of your low back?
- ❑ Do you use a hip belt?
- ❑ Do you use a chest belt?
- ❑ Do you organize the articles in the backpack so that the heaviest/biggest articles are closest to your back?
- ❑ Do you only carry the articles that you are required to have that day?

How many questions did you answer "Yes"? _____

Appendix 2. Backpack Intelligence Scoring Guide

Is my backpack too heavy?

There are 5 red flags to help you recognize when your backpack is too heavy: (1) Struggling to get the backpack on or off, (2) Pain when wearing the backpack, (3) Tingling or numbness, (4) Red marks, and (5) Changes in posture. Individuals with high backpack IQ recognize when their backpack is too heavy. If you answered 'yes' to questions in Section A, then your backpack is probably too heavy. That means, you need to LIGHTEN the backpack!

Is my backpack well designed?

If you answered 'yes' to the questions in Section B, then your backpack is well designed for comfort and safety. When it is time to go shopping for a new backpack, individuals with high backpack IQ look for these ergonomically designed features. Bring along the books etc. that you usually carry in your backpack. Try on the backpacks with the typical weight & articles that you usually carry, so you will know for sure how it feels and if the articles fit in. Resist buying a backpack that is extra large, because you'll be tempted to carry more than you really need to. Use the compression straps to keep articles stable inside the backpack. These are the ergonomic features to look for:

- Two contoured (curved) shoulder straps to allow your arms to move freely as you walk and to disperse the weight of your backpack across both shoulders.
- Padded back for comfort.
- Multiple compartments to better distribute the backpack weight.
- Hip and or chest belts to transfer the weight from your shoulders to your torso & hips, and to stabilize the backpack.
- Compression straps to secure & stabilize the articles in backpack, and bring the weight/contents in backpack closer to the back.
- Reflective stripping for visibility at night.

Am I wearing my backpack correctly?

Individuals with high backpack IQ wear their backpack correctly to promote wellness and prevent injury. The more questions that you answered 'yes' to in Section C, the higher your backpack IQ. Remember to:

- Use both straps of the backpack to keep your spine symmetrical (straight).
- Place the backpack between the bottom of the neck and the curve of the low back so that the largest, strongest back muscles are used. If you currently wear your backpack very low, raise the backpack a little bit at a time.
- Organize articles in the backpack so that the heaviest items are closest to your back to reduce muscle work. Lighter articles, like lunch or clothing can be placed on top of books or in compartments further away from your back.
- Bend your knees when lifting your backpack, and do not swing the backpack to put it on or take it off because this can hurt others that are nearby and or cause torsion injuries to your back.
- Do not let straps or items hang from the back of the backpack. These can get caught in car/bus doors, escalators or electric closing doors, and have resulted in tragic accidents.

Backpack Impact on Musculoskeletal Pain: Using Evidence to Make Changes

Kimberly A. Wesdock, PT, MS, PCS, Martin Dominguez, PT, CFMT

INTRODUCTION

In recent years, media coverage as well as literature on backpack use in school children has increased around the world. In the United States, reports by *CNN*, *The Wall Street Journal*, and *Time Magazine*, as well as local television stations emanated examining different issues related to backpack use. Typically included in these reports are backpack loads and the assumed relationship with musculoskeletal pain, specifically in the back. Studies, projects, and opinions on backpacks now abound in search engines such as *Google*. And, while only a handful of research articles on backpacks could be found 2 years ago in *PubMed*, numerous citations have since emerged in the peer-reviewed medical literature. As a result of often-alarming media reports, concerned parents are demanding change at the local and state levels, ranging from reduced homework to schools purchasing a second set of books. While still questioning the link between musculoskeletal pain and backpack use, school officials and legislators have already initiated policy changes.

The current evidence on backpacks and the relationship with musculoskeletal pain is conflicting, and often contrasts with societal perception. Wiersema and colleagues[1] documented musculoskeletal pain associated with acute backpack injuries in 247 children presenting to emergency departments. They found that the most common injury mechanisms were tripping, wearing a backpack, and getting hit with a backpack. Surprisingly, 89% of backpack injuries in their study did not involve the back. Goodgold and associates[2] surveyed 345 fifth through eighth grade students and found that one third of students complained of back pain. They determined average backpack loads in percentage of body weight (BW) for their sample according to student grade level: 19% BW (5th grade), 21% BW (6th grade), 14% BW (7th grade), and 15% BW (8th grade). Interestingly, they discovered that greater backpack loads did not correlate significantly with the back pain complaints. Negrini and Carabalona[3] conducted a cross-sectional study in Italy, weighing backpacks of 237 sixth grade students and surveying 115 students using a validated questionnaire to ascertain the association between backpacks and back pain. Time spent carrying the backpack, as well as subjective perceptions of the backpack causing fatigue, were associated with back pain, but the backpack's weight was not associated with back pain. These researchers acknowledged the association between backpack loads and back pain, however they concluded that this relationship was not direct. Furthermore, they suggested the existence of personal physical and psychosocial factors that should be investigated in school children. These psychosocial factors included general well-being and self-perception of health.

While examining the proposed link between backpacks and back pain, other investigators reported these psychosocial aspects along with physical findings. Troussier et al[4] surveyed 1178 students to investigate the risk factors of back pain in relation to backpack use. These researchers found that the prevalence of back pain in their sample was 51%. Thoracic, lumbar, and leg pain were most commonly reported. Variables that positively correlated with back pain included age, previous back injury, volleyball participation, female gender, and time spent watching television. Harreby and colleagues[5] surveyed 1379 thirteen to 16-year-old Danish school students during physical examination by school physicians to determine risk factors for back pain. Physicians measured height and weight, degree of joint hypermobility and tightness of the hamstring muscles, and calculated body mass index (BMI) for each student. Survey questions inquired about sports activity, television watching, computer use, job outside of school, smoking, and multiple aspects of low back pain. Recurrent and continuous low back pain (moderate to severe degree) was reported in 19.4% of children, and was positively correlated with female gender, BMI greater than 25 kg/m^2, poor physical fitness, smoking, competitive sports for boys, jobs requiring heavy lifting, multiple visits to health care providers, and reduced life quality. Backpack load effects were not reported as risk factors for back pain. Jones and coworkers[6] studied 1046 students aged 11 to 14 years at baseline, while also investigating the role of physical and psychosocial factors as risk factors for the onset of low back pain in school children. In children who were initially free of low back pain, they found that psychosocial factors (including behavioral issues) and pre-existing somatic pain complaints were predictive of future low back pain, similar to adult populations. In contrast, they found little evidence to support the link between backpack loads and the onset of low back pain.

Consequently, *are* current backpack loads really too heavy for school students? Do varying fitness levels in school children, related to current sedentary lifestyles, confound the relationship between musculoskeletal pain and backpack loads? What about the legislation in some states dictating school policy changes? Based on the current evidence available, the relationship between backpack loads and musculoskeletal pain in school children appears to be more complicated than originally assumed.

OUR BACKPACK AWARENESS CAMPAIGN

Using the evidence available and acting at the local level, we currently direct efforts at an elementary/middle school to effect positive changes regarding backpack use within the school environment. As active members of the Regional School Board of Directors at St. Edward-Epiphany School in Richmond, Virginia (the only 2 physical therapists on the board), we assist with policy development and programming to guide our Backpack Awareness Campaign. In addition to keeping up with the available literature on backpacks, local research studies and surveys at this particular school direct our recommendations for change as we develop and refine our comprehensive backpack program on an ongoing basis.

BACKPACK RESEARCH ON A LOCAL LEVEL

As part of our school's Backpack Awareness Campaign (*BAC*), we initiated a 3-phase research project 2 years ago to more closely examine multiple issues

related to backpack use. Because of the conflicting evidence available, we believed that our own research would assist us in decision-making on a local level regarding backpack use. Subsequently, results from these studies were presented nationally at the Gait and Clinical Movement Analysis Society 7th Annual Meeting in April 2002[7] (phases 1 and 2), and at APTA's Combined Sections Meeting in February 2003[8] (phase 3).

Phase 1 comprised a formal pilot study conducted at the primary author's (KW) hospital. We obtained Institutional Review Board (IRB) approval for this study and a small grant. Ten 5th and 6th grade students were randomly selected from our local school and agreed to participate in the study. Plans for the study had been previously introduced to them via a colorful PowerPoint presentation at the school as part of the *BAC*.

Using computerized motion analysis, a custom 42-marker set was used to collect head, shoulder, and trunk posture and kinematics, in addition to lower extremity kinematics, kinetics, and spatial-temporal parameters. The 6-camera Motion Analysis Corporation system used 120 Hz HiRes™ Falcon cameras strategically positioned on the laboratory walls. With reflective markers in place from head to toe, each student walked on a level walkway carrying 4 different backpack loads (0%, 10%, 15%, and 20% of each student's body weight). The order of load conditions was randomized for each student at each data collection session to reduce order bias. The same backpack was used for all students. The students walked at a self-selected velocity and cadence, and backpack position was standardized on each student using both straps. Additional data included height, weight, leg lengths, backpack style, method of carrying the backpack, scoliosis screening, and frequency and duration of back pain (if experienced). All data were collected in a single session for the 10 students, with 5 students returning a second time to establish test-retest reliability for each load condition.

Phase 2 of the study involved 3rd - 7th grade students at the participating school. The school nurse collected heights and weights on 237 students. We coordinated efforts to weigh backpack loads on a single day (N = 227), and to perform scoliosis screenings for the students whose parents signed consent (N = 59).

Results of Phase 1 and 2 of our studies revealed significant increases in forward head and anterior trunk postures with increasing loads ($p < .001$), as well as a significant increase in anterior trunk lean during gait in the 20% weight condition ($p < .05$). These findings coincide with Hong and Cheung's recent study.[9] No significant changes were found in hip, knee, or ankle kinematics, kinetics, or spatial-temporal gait parameters across conditions. No correlation was found between positive scoliosis screenings and backpack loads. Confirming the suspicion about heavy loads at our school, 38% of all students in grades 3 through 7 carried backpack loads exceeding 20% of body weight. See Table 1 for mean backpack loads according to grade level.

Thus, we demonstrated that our students do carry excessive loads in their backpacks, and that loads exceeding 20% of body weight do cause significant increases in forward head and trunk postures during standing and walking. Goh et al's[10] data demonstrating the increased forces acting at the L5/S1 joint with increasingly heavy backpack loads, in addition to our data and the available evidence, reinforced our desire to continue with our approach to *BAC*. We thought it prudent to address the backpack issue at our school using a variety of preventive and proactive approaches in order to prevent dysfunction in addition to musculoskeletal pain in the student population.

Subsequently, we hypothesized that the etiology of musculoskeletal pain in school children, commonly attributed to heavy backpacks alone, is multifactorial and also relates to the current sedentary lifestyles of adolescents. This hypothesis guided phase 3 of the study, which involved a school-wide survey that we developed and distributed to all school parents. All surveys were anonymous. The surveys included questions on backpack type, pain complaints, physical and sedentary activity reports, availability of cable television and video games at home, fast food consumed per week, and importance of nutrition and diet at home. Findings were reported for 126 students in 3rd - 7th grades. In a different setting, the school nurse collected heights and weights for 198 students in 3rd - 7th grades. Using a customized Excel spreadsheet, body mass indices (BMI) were calculated from the height, weight, age, and gender data for each student according to the National Center for Chronic Disease Prevention and Health Promotion (CDC) growth charts (2000). All BMI data were aggregated according to age and gender. Strict confidentiality was maintained.

Results from Phase 3 revealed that 35 of 126 (28%) students (57% girls, 43% boys) complained of musculoskeletal pain, supposedly caused by their backpacks. Sixth grade students voiced the greatest number of pain complaints, comprising 31% of the total painful students. The most common locations of pain included the back (37% of pain complaints), followed by the neck (18%) and shoulders (18%). Other locations of musculoskeletal pain presumably attributed to backpack use included back and neck areas (9%), shoulders and back (3%), neck and shoulders (3%), headaches (3%), chest area discomfort (3%), leg pain (3%), and hand numbness (3%).

Sixty-five percent of the total number of students surveyed used standard backpacks (using both straps), while 34% of students used rolling backpacks, and 1% used one-shoulder bags. Backpack type distribution in the painful students (N = 35) was no different than the entire student population of 3rd through 7th graders (N = 126). That is, the students complaining of pain did not use standard 1- or 2-strap backpacks more often than rolling backpacks (which are often presumed safer for the spine).

Corresponding with our hypothesis regarding the multifactorial etiology of musculoskeletal pain in school children, we sought to determine the ratio of physical to sedentary activity in these children. For the total number of students surveyed (N = 126), physical activity, defined in our survey as time involved in sports activities in addition to outside play, was performed an average of 2.1 hours per day (median 2.0 hours, SD =

Table 1. Mean Values for N = 227 Students

Grade	Backpack Load in % Body Weight (BW)	Backpack Weight	Student Weight	% of Students Carrying Backpack Loads ≥ 20% BW
3rd	17%	11 lbs.	65 lbs.	27%
4th	20%	16 lbs.	82 lbs.	48%
5th	17%	15 lbs.	92 lbs.	33%
6th	15%	13 lbs.	94 lbs.	19%
7th	24%	26 lbs.	111 lbs.	73%

1.2, range 0 - 5.7 hours). Sedentary activity, defined as television viewing along with computer and video game usage, comprised an average of 2.0 hours per day (median 1.7, SD = 1.8, range 0 - 10.0 hours). These values did not differ significantly in the 35 students who complained of musculoskeletal pain. Interestingly, 86% of all school families reported having cable television at home, and 53% had video games. Students ate fast food an average of 1.3 times per week, with 96% of families rating diet and nutrition as important to them.

Documenting body composition of the students, we discovered that one-fourth of the students studied were at risk for overweight, or were classified as overweight in our school. "At risk for overweight" in youth is defined as between the 85th and 95th percentiles of BMI.[11] The term 'overweight' in youth is defined as a BMI-for-age value greater than the 95th percentile. Twenty-four percent of students in 3rd - 7th grades (ages 8–13 years) had BMI values exceeding the 85th percentile, according to the CDC growth charts for gender and age. The male students in our sample comprised a greater proportion of individuals with BMI values exceeding the 85th percentile, compared with the female students. Nine percent of students had BMI values greater than the 95th percentile. According to data from the National Health and Examination Survey (NHANES), the percentage of overweight children was 14% of the US youth population in 1999 (up from 5% twenty years earlier).[11] Due to the anonymity of the surveys, we were unable to correlate BMI values with the subset of painful students.

USING OUR OWN EVIDENCE TO GUIDE CHANGE

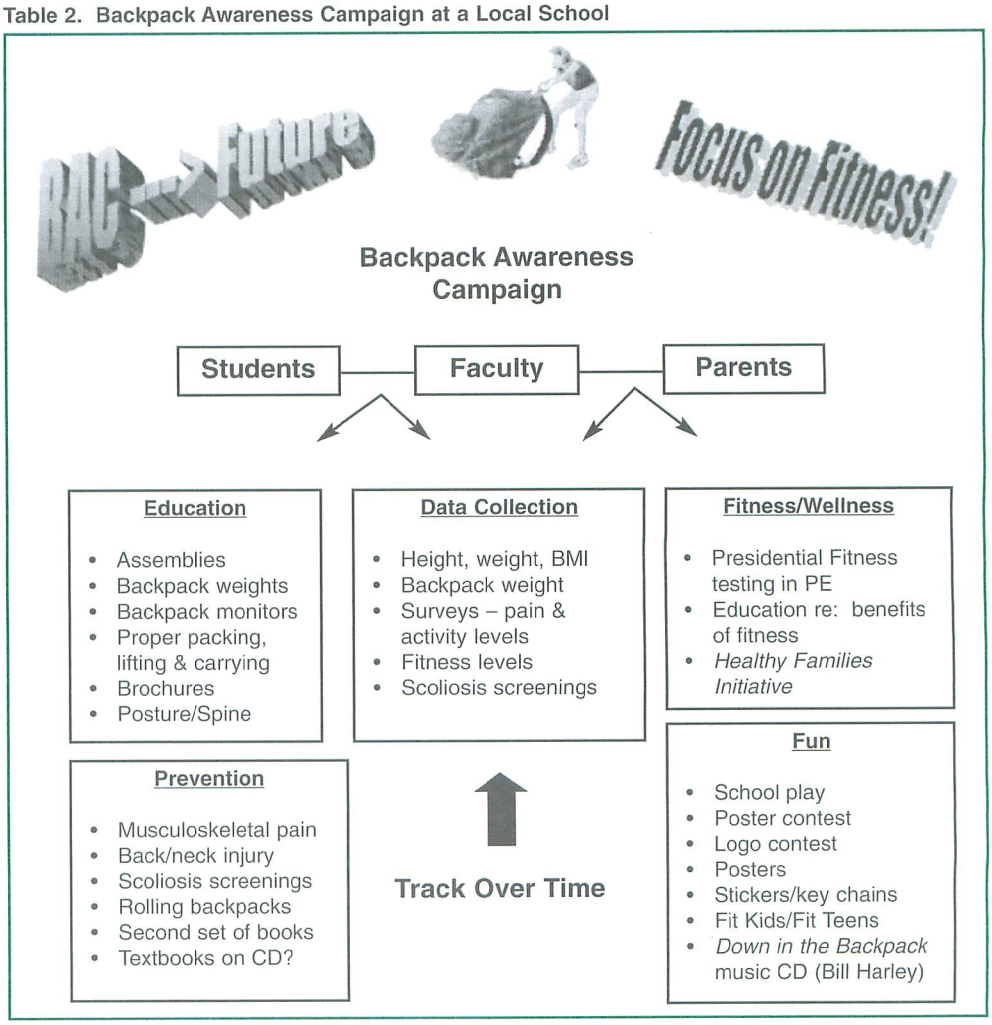
Originally developed 5 years ago, the Backpack Awareness Campaign at our local school currently involves not only the school students (preschool through 8th grade), but faculty and parents as well. See Table 2. To date, new activities are planned each school year to increase awareness regarding the proper ways to load, lift, and carry backpacks as well as proper posture. In the past, we have invited different medical professionals from the community to discuss spine-related issues and backpack loads. Disseminating information on a regular basis, we share findings from the current literature with the school community. We coordinate annual backpack weigh-ins, and maintain the data in Microsoft Excel spreadsheets (beginning last year) to track trends over time. Student weights, routinely collected by the school nurse on an annual basis, are used to calculate percentage of body weight (% BW) loads carried in the backpacks. These data regarding backpack loads carried by the students are reported to the faculty, students, and parents at the school in order to encourage positive changes regarding backpack use. We continually encourage all individuals within the school community to brainstorm new ideas to 'lighten the load.'

Incorporating the current national data on childhood overweight issues in conjunction with our own findings, we emphasized a fitness approach with last year's *BAC* program. Last year's school theme was "Backpack Awareness–Focus on Fitness!" which highlighted the fact that physically fit students with strong muscles and good posture are better equipped to carry modern-day backpacks. This theme tied in closely with the Presidential Fitness testing that was initiated last year at the school in the physical education (PE) classes. Pretests were performed at the beginning of the school year by the PE teacher, and scores were compared with end-of-the year post tests. As part of our *BAC*, we plan to track the fitness levels of students according to grade, age, and gender to help document the effectiveness of our program.

Numerous other activities for the school's *BAC* occurred during the campaign's kick-off week, which coincided with National Backpack Awareness Day last September. These activities included release of results from the school-wide survey of backpack use, which we had conducted the previous spring (phase 3 of our backpack project). To promote school-wide student involvement in the campaign, we also sponsored a poster contest. Consisting of original artwork, all posters illustrated how to properly wear a backpack, how to lighten the backpack load, or how to acquire 'perfect' posture. Members of the *BAC* planning committee awarded prizes to all participants. Additionally, a school-wide assembly, held at the start of the school year for parents and faculty, provided an ideal venue for the distribution of educational materials on backpack use, as well as current backpack facts.

Another activity performed early in the school year included a play entitled

Table 2. Backpack Awareness Campaign at a Local School



"Attack of the Backpacks" (written by author KW of this article and her son, a 5th grade student). This innovative play featured up-to-date backpack statistics, proper backpack use, as well as optimal posture and body mechanics in a humorous, fun-filled atmosphere. Fifth grade students, along with teachers from the 3rd – 5th grades, performed this play. The audience consisted of all 3rd – 5th grade students along with their parents who were invited to attend, and the play was videotaped. Appropriate music, consisting of Bill Harley's *Down in the Backpack*' song, added another dimension to the play. We awarded this appropriate music cassette tape as a prize to one young actor. Active participation in the play by school faculty increased awareness of heavy backpack loads, as faculty members present (including the school principal) wore student backpacks at the play's ending. Our creativity for *BAC* is limited only by time commitments to our day jobs!

SCOLIOSIS SCREENINGS

When the *BAC* originated 5 years ago, a link between scoliosis and backpack loads was suspected. Therefore, scoliosis screenings were scheduled annually to coincide with the kick-off week of the campaign. Using a Scoliometer and the advice of a pediatric orthopaedic surgeon, we established a screening program at the school that we now perform on an annual basis. Using parent volunteers who are physical therapists or nurses, we train them to use a cut-off value of 5° on the Scoliometer to distinguish a positive screen. After each school student was screened, American Physical Therapy Association (APTA) brochures on scoliosis were distributed for the students to take home to their parents, with the results of the screening. We encouraged parents to call us with any questions regarding their child's posture or scoliosis in general. The parents of all students who screened positive were contacted via telephone by the primary author to review findings and provide recommendations for follow-up with the student's pediatrician or a pediatric orthopaedic surgeon.

Last fall, a third year physical therapy student assisted with the screenings, as part of her *Pediatric Module* affiliation at the first author's institution. As clinical instructors for the physical therapy program in our area, we believed that this experience proved valuable to the affiliating student. Future plans include physical therapy student involvement in subsequent scoliosis screenings.

Interestingly, we became involved in scoliosis screenings when the school nurse requested our assistance with the scoliosis screening program. Even though a direct link between scoliosis and backpack loads has not been established to date, the screening program heightens awareness of posture[12] and is well received by the parents of the school students, as reported on our survey instrument for school families. Therefore, we continue to manage the scoliosis screening program at the school, and we conduct the screenings as part of the comprehensive *BAC*.

CONCLUSIONS

The current dilemma regarding backpacks and the relationship with musculoskeletal pain in school children appears related to multiple factors, which we are addressing through our programs. We plan to continue our Backpack Awareness Campaign, including annual data collection to monitor backpack loads, while educating students, parents, and faculty to ensure proper packing, lifting, and carrying of backpacks. Last spring, based on the findings from our backpack studies, our school board voted in favor of purchasing a second set of textbooks, to be kept at home, for grades 4 through 7. We are also currently investigating the possibility of obtaining textbooks on CD-ROM for student use.

In conjunction with the PE teacher at this school, we plan to monitor fitness levels of students and track them on an annual basis. We will explore additional ways to encourage fitness and physical activity within the school community.

In addition to attention directed at backpack loads and the methods of lifting and carrying backpacks, lifestyle habits of school students will also be addressed at the school. Increasing the ratio of physical to sedentary activity, along with improving fitness levels in students, may assist in not only reducing musculoskeletal pain in school children, but also in optimizing health. As a spin-off from our studies at the school, in conjunction with the data on the current obesity epidemic in the United States,[11,13] we have implemented a *Healthy Families Initiative* to encourage enhanced opportunities for physical activity as well as healthy eating habits for the school students and their families. Acknowledging the Surgeon General's *Call to Action To Prevent and Decrease Overweight and Obesity 2001,*[13] we continue to propose policies and subsequently implement new ways to improve lifestyle habits in an effort to combat this public health epidemic. As this article goes to press, we are proactively responding to this *Call to Action* and exploring opportunities for the implementation of our *Healthy Families Initiative*, in addition to our involvement with *BAC* at the local level.

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Kimberly Wesdock is the Motion Analysis Laboratory Physical Therapist at Children's Hospital in Richmond, Virginia as well as the Clinical Assistant Professor of Physical Therapy at Medical College of Virginia-Virginia Commonwealth University also in Richmond. Martin Dominguez is the Administrator at Health South Sports Medicine & Rehabilitation Center in Richmond, VA.

Postural Changes Following Backpack Loading in School-aged Children

Mary Ann Wilmarth, PT, DPT, MS, OCS, MTC, Cert. MDT,

Timothy S. Hilliard, PhD

INTRODUCTION

Health professionals including orthopaedic surgeons and physical therapists are seeing an increased number of children with the type of mechanical back pain that is much more typical of a middle-aged adult. In response to the possible postural changes and complaints of pain there are increasing numbers of studies that are examining the effect of ergonomic factors such as backpack use on the musculoskeletal health of children.[2,5-7,9,12,20]

Backpacks are commonly used with school-aged children and for various reasons the backpacks tend to carry more weight these days. Thus, just as adults may face occupational hazards on the work site, carrying heavy backpacks can be considered an occupational risk for children. The repeated carrying of heavy loads, such as with school backpacks, may place additional stress on rapidly growing adolescent spinal structures, making them prone to postural change.

The etiology of back pain is often enigmatic. With the specific use of backpacks in school-aged children we have the opportunity to look at a mechanical cause of musculoskeletal problems that can possibly have long-term effects. By identifying the causes of the pain complaints we can then be better able to treat the problems and ultimately prevent such dysfunctions from occurring in the first place.

According to Hegrini et al,[9] 34.8% of Italian schoolchildren carry more than 30% of their body weight at least once a week. This exceeds limits proposed even for adults. While limits have been proposed regarding the percentage of body mass that can be safely carried, little quantitative evidence backs up these standards. The assumption is that carrying loads above 10% to 15% of total body mass results in increased neck and back pain; however, this research question is still being studied.

Grimmer, Williams, and Gill[7] looked at the associations between adolescent head-on-neck posture, backpack weight, and anthropometric features with high school students in Adelaide, Australia. They found a significant change in craniovertebral angle at every year level, when comparing standing posture with no backpack with posture when carrying a backpack. This change was greatest for the youngest students.

Grimmer and Williams[6] looked at gender-age environmental associates of adolescent back pain. Their study of 1269 adolescents in volunteer high schools in Adelaide, Australia describes adolescent low back pain and tested its associations with environmental features of the backpack load, time spent carrying the loads, time sitting, and time spent playing sports. They found that backpacks were the preferred method of load carrying with two-thirds of the wearers preferring to carry the load over 2 shoulders.[6]

Chansirinukor et al[2] looked at the effects of wearing loaded backpacks on high school students 13 to 16 years of age. The authors chose this group of students due to the fact that they have significant increases in growth and development with skeletal and soft tissue changes. The results of the study indicated that forward head posture measurements were increased with heavy backpack loads. In addition, backpacks weighing 15% or more of an individual's body weight appeared to be too heavy to maintain correct standing posture.[2]

Grimmer and colleagues[5] performed a randomized controlled experimental study looking at adolescent standing postural response to backpack loads. They found that neither age nor gender was a significant factor when comparing postural response to backpack loads or conditions. There was evidence refuting the 'rule-of-thumb' to carry the backpack high on the back. They recommended that typical school backpacks be positioned with the center at the waist or hip level. Finally, they did not find evidence to support the 10% body weight limit.[5]

One student even started studying the relationship of backpacks and pain due to her own experience. Shruti Iyer[12] was a sixth grader in Houston when she noticed back pain and considered the possibility that the cumbersome backpack she lugged to school might be a culprit. This spurred her to start her own study regarding backpacks and back pain, and in the ensuing years Shruti has surveyed hundreds of schoolchildren from the United States and India. Her quantitative and international study found that even when students carried less than 15% of their body weight in their backpacks, almost one quarter of the students still complained of pain.[12]

Hickey, Winnegge, and Cigna compared the effects of various types of backpacks and an educational program on the incidence of adolescent back pain.[10] They concluded that the educational intervention based on the American Physical therapy Association (APTA) and American Academy of Orthopaedic Surgeons (AAOS) recommendations did not appear to be effective if the student continued to carry more than 10% of their body weight in their backpack. This study did find that the use of an air filled backpack was effective in reducing adolescent back pain.[10]

Lohman et al[15] looked at the effects of backpack load and wearing preference on spinal posture in elementary school students. They demonstrated a positive correlation between backpack weight and spinal deviations in the cervical and thoracic spine in the sagittal plane. Lohman et al[15] further recommended a maximum weight no greater than 10% of the student's body weight due to the deviations in spinal posture observed in their study.

The full implications of postural changes related to backpack use are not clear. Furthermore, reliably quantifying the exact nature of such postural changes is often expensive and time-consuming. Qualitative assessment of postural changes may offer less expensive, faster measurement but lacks the scientific rigor necessary to relate postural changes and clinical symptoms with the underlying cause(s).

The purpose of this investigation was to assess potential changes in the head-on-neck posture of elementary school-aged children when wearing backpacks. The method of assessing the head-on-neck posture in this study is via the craniovertebral angle (CVA) with the Head Posture Spinal Curvature Instrument (HPSCI).[24] In addition, this study examined the association between CVA with the use of the backpack and the percentage of the student's body mass in the backpack.

METHODS

A convenience sample of 34 elementary school-aged children was obtained from the general student population at a private school in Andover, Massachusetts. Informed consent procedures governing the recruitment of minors were followed, as established by the Northeastern University Institutional Review Board. A description of the study including all risks and benefits was sent home to the parent/guardian of each child and informed consent was obtained for each subject. Written and verbal descriptions of the measurement procedures were given to all children participating in the study. The rights of all subjects were protected. A total of 19 girls and 15 boys participated in the research project. All subjects were free from any musculoskeletal or neurological disorders that might influence static head posture.

Each subject arrived at the testing area with a signed informed consent document and their own backpack, loaded with that given day's self-selected backpack mass. Total body mass and backpack mass were measured via a calibrated scale. After mass measurements were taken, each subject marched in place 5 times and then flexed and extended the neck 5 times in order to establish their own neutral head and neck position. The CVA was then measured using the HPSCI from a left side sagittal view. All CVA measurements were assessed by manually locating the C7 spinous process and the tragus of the ear. The HPSCI was maintained perpendicular to the floor by means of a bubble level built in to the device. The axis of rotation of the HPSCI was visually aligned with C7 and the mobile arm of the device was positioned over the tragus (see Figure 1). Craniovertebral angles were calculated to the nearest degree from an angular scale attached around the axis of the device. Following a 2-minute rest period, subjects repeated the procedure again, this time with their own backpack worn in a self-selected fashion over both shoulders. All CVAs were measured by a single investigator, and all data values were hand recorded by a different investigator.

Figure 1. Measuring head posture via the craniovertebral angle (CVA) under loaded (backpack) conditions with the Head Posture Spinal Curvature Instrument (HPSCI).

Craniovertebral angles were assessed between gender groups and across load conditions via a group by condition Analysis of Variance (ANOVA). Pearson correlations were calculated for all possible combinations of CVA, total body mass, backpack mass, and percentage total body mass contained in the backpack. All data were analyzed using SPSS v10.0 statistical analysis software. A probability level of $p < .05$ was set as the threshold for significance for ANOVA.

RESULTS

The ANOVA results revealed significant group and condition effects, with no significant group by condition interaction (see Table 1). The CVA was greater in females (54.29°) vs males (51.0°), and greater in the unloaded condition (54.91°) vs the backpack condition (50.76°). Descriptive statistics are shown in Table 2. Significant correlations were found between CVA and backpack mass (r=.73) and between CVA and body mass (r=.59) in females (Table 3). Correlation results revealed no significant correlation between CVA and backpack mass or between CVA and percent of body mass in the backpack in males (Table 4).

DISCUSSION

Physical therapists are aware of the potential problems that can occur when backpacks are used incorrectly and/or contain too much mass. This can alter the natural curve or lordosis in the lower back, promoting poor posture throughout the kinetic chain, potentially leading to back and neck pain. Back pain is already the most common ailment of working Americans, costing the US economy bil-

Table 1. Univariate Analysis of Variance of CVA

Source	SS	df	MS	F	Sig.
Group	181.41	1	181.41	6.78	.011
Condition	278.45	1	278.45	10.40	.002
Group X Condition	6.21	1	6.21	.232	.632

Table 2. CVA by Group and Load Condition

	Mean	SD	Min.	Max.
Females (N=19)	54.3	4.5	45	64
Males (N=15)	51.0	6.6	35	61
Unloaded	54.9	5.2	40	64
Backpack	50.8	5.5	35	60

Table 3. Pearson Correlation Matrix for Females

	CV1	CV2	Pack Mass	Body Mass	Percent Mass
CV1	...	.730*	.787*	.281	.630*
CV2		...	.730*	.588*	.341
Pack Mass			...	.316	.758*
Body Mass				...	-.355

Table 4. Pearson Correlation Matrix for Males

	CV1	CV2	Pack Mass	Body Mass	Percent Mass
CV1	...	.940*	.7318*	-.209	.305
CV2		...	.176*	-.197	.203
Pack Mass			...	-.154	.845
Body Mass				...	-.647

lions of dollars annually in lost wages and productivity. If back and neck pain start at an earlier age, the potential cost to the US economy could be magnified.

In this study the investigators used the Head Posture Spinal Curvature Instrument (HPSCI) in part to establish normative data regarding the typical postural response with use of a backpack. Ultimately, the results of this and other similar studies may lead to the establishment of appropriate preventative measures that can decrease spinal dysfunctions due to backpack use. The HPSCI has been chosen for use for several reasons. The HPSCI is a noninvasive, easy to use, and inexpensive instrument that can determine a person's head posture and spinal curvature. Intra-rater reliability of the HPSCI with assessment of the CVA in university-aged students has been shown to be high (R >.9).[11]

A study has been completed with the HPSCI regarding posture and the use of backpacks or bags with college-aged students.[25] The difference of loaded versus unloaded CVA with college-aged students was an average of 1.84° (males 2.55 and females 1.13) whereas with school-aged students there was a 4° difference. Both studies indicate a more forward head posture as measured via the CVA with the use of a backpack or bag. Some of this difference could be due to a higher percentage of total body mass being carried by children in this study. The differential gender effect revealed in this study also warrants further investigation. Do the differences in gender noted in this study continue through the high school and college years and into adulthood? We may even further speculate as to whether or not this becomes a women's health issue and if so, are there body mass index (BMI) or hormonal issues? Harreby and colleagues[26] found a positive correlation with low back pain and female gender and BMI greater than 25 Kg/m^2 in addition to other risk factors.

More and more research is currently being completed regarding backpack use and back and neck pain through the years. The full implications will most likely not be known for years. However, it certainly appears that further research is warranted. This includes quantification of anterior trunk lean in combination with head posture as seen in studies by Goodgold et al[27] and Wesdock et al.[28,29] The HPSCI offers clinicians and researchers the opportunity to assess head posture and changes in posture in a quick, inexpensive, and reliable fashion. Pilot data suggests agreement between HPSCI measures and motion analysis measures.

CONCLUSION

A significant decrease in CVA occurred when children wore backpacks with an average of 16% of their total body mass. The magnitude of the load in the backpack was correlated with the resulting CVA in females only. There may be a limit to the amount of forward head posture that occurs regardless of load. Additionally, forward trunk lean was not assessed and also plays a role in compensating for backpack loading.[27-29]

A decreased CVA implies a more anterior or forward head posture. Such a posture may lead to increased forces on the cervical vertebrae and supporting structures. The chronic effects of such a posture on the cervical, thoracic, and lumbar spine for school-aged children are currently unknown.

The etiology of musculoskeletal pain with school-aged children is multifactorial in nature and backpack use appears to be one factor that is a part of this complex situation. One thing is certain though, further investigation is indicated to look at short- and long-term postural changes, neck and back pain, and dysfunctions, as well as the most beneficial interventions with backpack use.

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Mary Ann Wilmarth, is an Assistant Clinical Specialist, Department of Physical Therapy at Northeastern University in Boston, MA. Timothy S. Hilliard, PhD is Assistant Professor, Department of Physical Therapy at Northeastern University, Boston, MA.

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The Amount and Variation of Craniovertebral Angle Changes in College-aged Students Using One-strapped and Two-strapped Backpacks and Bags

Christine T. San Agustin, MSPT, CSCS, Mary Ann Wilmarth, PT, DPT, MS, OCS, MTC, Cert MDT, Jonathan Raymond, MSPT, Timothy S. Hilliard, PhD

INTRODUCTION

The academic rigors placed on university students continue to evolve with the times and may have different effects compared with those in years past. The growth in technology, continual development of textbooks, and popular endeavors for holistic personal enrichment are all contributing factors to recent accounts of musculoskeletal pain and postural dysfunction in even younger populations.[1-5] Many items accompany these aspects of individual growth, and are carried in a most compact and convenient form of transport, namely the *backpack*.

The scholastic course of studies for many American students continues for a significant number of years. Many students continue on to postsecondary and graduate education. The amount of time spent in school and studying can often be 16 years or more. Carrying textbooks, notebooks, and equipment in a backpack or bag is not uncommon.

The purpose of this study is to quantify the postural changes, particularly the head on neck angle or craniovertebral angle (CVA), when carrying a 1-strapped or 2-strapped backpack or bag with male and female university students. The CVA is defined as the angle formed from a horizontal line passing through the C7 spinous process and a line passing through the tragus of the ear[1,2] (Figure 1).

Many studies to date have investigated these changes in school-aged children and adolescents.[1,2,3,6-12] There have been few, if any, thorough investigations of the backpack relationship in students at a postsecondary level where texts and academic workloads increase significantly along with activity in computer and desk interaction.[12-14] This information has further implications that may ultimately keep consumers informed of the type of backpack or bag which may be optimal for them, and how to use it properly.

Packing a load posteriorly in a limited amount of space increases the tendency to overload the bag.[4,8,10,12] It has been shown in previous studies that there is an association between backpack loads and musculoskeletal and locomotive problems for children.[3-5,8-10] Backpacks alter the students' unloaded posture and reposition it into a more strained or stressed improper, potentially unbalanced posture, with the addition of excessive external force.[1,6] The developmental growing stages of the younger-aged children may be more vulnerable to these external loads causing misalignments of the spine.[6,10] These can be clinically recognized with symptoms of back, neck, and shoulder pain.[1,2]

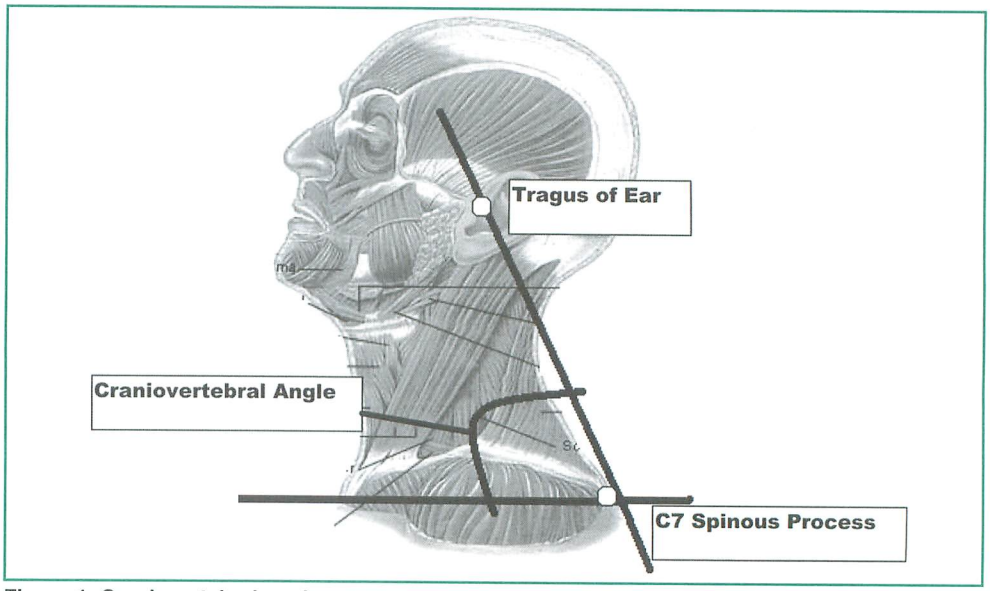

Figure 1. Craniovertebral angle.

Increasing weight and incorrect mode of carriage of a backpack could be socially influenced as it has been considered to be 'cool' to carry a heavy bag[15] or to carry trendier and more stylish over the shoulder sling type messenger bags. In fact, about one-third of central Texas primary and middle school students (K-8th) surveyed claimed to use one strap.[9] Theories of positional adaptation to the incorrect usage of backpacks also may contribute to the ultimate postural changes in an older age.[2] Other studies involving a young adult population were found with the United States Army Research Institute of Environmental Medicine (USARIEM). LaFiandra et al[16] have studied the type of backpack and the resulting biomechanics of active soldiers, but they have not focused on the CVA in particular. These researchers found that gait and muscle activity changed while carrying a posterior load. In the cervical region, increasing loads recruited more upper trapezius and erector spinae muscle activation.[16]

METHODS

Forty-eight volunteers between the ages of 18-23 years were gathered by verbal request, class announcements, and word of mouth at Northeastern University (NU). The subjects were first asked to sign an informed consent document approved by the University's Institutional Review Board. The researchers felt that this age range encompassed the majority of students in college. Questionnaires were also given as a screening tool for the inclusion or the exclusion of the individual. Students were excluded if they did not fall in the 18- to 23-year-old age range, if a chronic or acute musculoskeletal or neurological condition affecting the spine or extremities was present, or if they were not a student. No one was excluded from the study; subjects were aware of the procedures.

All objective data was recorded on a Microsoft Excel spreadsheet program kept by the researchers. The subjects

then proceeded to a standard scale to be weighed and measured. Body weight alone was recorded and then body weight with the backpack or bag were recorded in pounds. The subject's age, gender, type of bag (1 or 2 strapped), number of straps used (1 or 2), and major course of study were noted. Height was measured in total number of inches.

The subject was then asked in a random manner to either remove his or her bag or wear it. He or she then marched in place 5 times and then flexed and extended his or her neck 5 times before being asked to assume a natural position looking straight ahead. The researcher then measured the CVA using the head posture spinal curvature instrument (HPSCI) with a left side sagittal view. The C7 spinous process was identified by palpation with active flexion and extension by the subject. The axis of the instrument was visually aligned with the C7 spinous process with the bubble level on the stationary arm remaining centered. The dynamic arm was aligned with the tragus of the ear. The investigator was able to maintain the axis of the HPSCI at C7 by palpating the spinous process with his third digit and holding the stationary arm level simultaneously in the same hand. Measurements were read in this manner and then verbally announced with another researcher entering the measurement numbers into an Excel program. All CVAs were measured by a single investigator, and all data values were recorded by a different investigator. CVA1 indicated a measurement WITHOUT the bag; CVA2 indicated a measurement WITH the bag. That subject would then walk around the room for one lap without the bag, while the next subject was measured for either CVA1 or CVA2. Upon returning from the one lap rest period, the opposite bag status (ie, with or without) was requested for the second reading of CVA. The subject was then dismissed. Total time per subject was approximately 5 to 10 minutes.

RESULTS

Out of the 30 women and 18 men participating in this study, a total of 10 individuals carried backpacks or bags with one strap, and 38 carried 2-strapped bags. The data were evaluated using the SPSS version 11.0 Statistical Analysis Computational Package. The averages of CVA with and without the bag can be seen in Table 1.

Overall, the average CVA among the students measured 49.23° ± 5.02° without carrying the bag (CVASANS), and 47.56° ± 5.48° with the bag on (CVAWITH), a difference of 1.67°. The values without carrying the bag are larger in all cases versus carrying the bag. The women's values were, on average, higher than the mens. Note that a smaller value of CVA is observed as more forward head posture.

Gender vs. Number of Straps

Multivariate Analysis of Variance (MANOVA) tests were conducted to determine whether the factors of gender or number of straps used caused a significant difference in the dependent variables of the CVASANS and the CVAWITH. Significance was set before testing by the researchers at the .05 level. Table 2 shows the results of the first MANOVA test.

In this test, gender was the main factor that caused a significant change in CVA with carrying a bag shown by the value of p=.048. With further investigation and division of data by gender, it was determined that in this study males were the ones with a significant difference in CVA when wearing the bag. The males' average CVA unloaded was 48.11° ± 7.20°, while females' CVA averaged 49.90° ± 3.04°. While carrying the bag, men averaged a measurement of 45.56°

Table 1. Average CVA With & Without (SANS) a Backpack or Bag Among Females (1), Males (2) & Total

Gender		CVSANS	CVWITH	STRAPS
1	Mean	49.90	48.77	1.83
	N	30	30	30
	Std. Deviation	3.04	3.65	.38
2	Mean	48.11	45.56	1.72
	N	18	18	18
	Std. Deviation	7.20	7.31	.46
Total	Mean	49.23	47.56	1.79
	N	48	48	48
	Std. Deviation	5.02	5.48	.41

Table 2. MANOVA of Gender and Number of Straps Affecting CVA With (CVAWITH) and Without (CVASANS) a Backpack or Bag

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	CVSANS	60.762[a]	3	20.254	.792	.505
	CVWITH	148.803[b]	3	49.601	1.731	.175
Intercept	CVSANS	75278.760	1	75278.760	2942.361	.000
	CVWITH	70446.087	1	70446.087	2458.053	.000
GENDER	CVSANS	12.046	1	12.046	.471	.496
	CVWITH	118.068	1	118.068	4.120	.048
STRAPS	CVSANS	14.475	1	14.475	.566	.456
	CVWITH	24.687	1	24.687	.861	.358
GENDER * STRAPS	CVSANS	12.046	1	12.046	.471	.496
	CVWITH	6.182	1	6.182	.216	.645
Error	CVSANS	1125.717	44	25.584		
	CVWITH	1261.009	44	28.659		
Total	CVSANS	117515.000	48			
	CVWITH	109995.000	48			
Corrected Total	CVSANS	1186.479	47			
	CVWITH	1409.812	47			

[a] R Squared = .051 (Adjusted R Squared = -.013)
[b] R Squared = .106 (Adjusted R Squared = -.045)

± 7.31° as compared to females' 48.77° ± 3.65° (Figure 2).

The number of straps did not have a significant effect on changing the CVA (p=.358). Some of the subjects did have 2-strapped bags and preferred to use one; others used only 1-strapped bags. Only 10 subjects used the 1-strap carrying method while 38 employed 2-straps.

Backpack or Bag Weight vs. Percentage of Total Body Weight

A second MANOVA was conducted to determine if bag weight or the bag's percentage of total body weight were significant factors affecting CVA. Neither of the 2 factors had any significant role in changing the CVA before or when carrying a bag. It was important to note, however, that overall total bag weight among the subjects remained relatively equal (10.44 lbs. ± 6.34 for the males and 9.78 lbs. ± 3.80 for the females). Correlations between bag weight and CVAWITH yielded a value of r = -.604, indicating that as bag weight increased, CVAWITH decreased or forward head posture worsened. This result is further supported by previous studies by Grimmer et al.[6] Analysis of the bag's percentage of total body weight showed that the males' percentages were, on average, less than the females' (5.3736% ± 3.0370% for males versus 7.3315% ± 2.8479% for females). These values can be misleading since the males were generally heavier than the females. The males weighed in at an average of 197.44 ± 39.74 lbs. and the females weighed an average of 134.62 ± 17.94 lbs.

Height and Course of Study

Finally, a third MANOVA was conducted to see if the subject's height or the course of study at the university (ie, physical therapy major versus a nonphysical therapy major) would change the CVA while wearing or not wearing a backpack or bag. Statistical analysis showed that there was no significant change (p=.525) based on the subject's height, but there was a significance of p=.013 according the major of the subject. Physical therapy (PT) majors averaged 49.91° ± 2.93° without a backpack or bag versus the non-PT majors who averaged 47.73° ± 7.85°. Upon donning a backpack or bag, the students majoring in PT changed their CVA to an average of 48.97° ± 3.38° as opposed to the non-PT majors who measured an average of 44.47° ± 7.73°. The percentage change for PT majors was .94 less with donning a backpack or bag and for non-PT majors was 3.26 less.

DISCUSSION

The resultant values from this study showed the multiple factors that may help to clarify the influence of bag carriage on head posture. Overall, CVA worsened once a backpack or bag was carried. There were some cases, however, where CVA actually improved after putting on a backpack or bag. It is possible that the weight and placement of a bag may provide tactile stimulation to facilitate postural correction and a passive stretch to the anterior structures. The number of straps on the bag, and thus, the type of bag carried (ie, a backpack versus a shoulder bag) had no significant effect on head posture. The effect of a shoulder bag or unilateral loading may not be substantial enough to affect anterior-to-posterior head posture as it can for rotational or lateral head positioning. Further studies comparing global spinal position with different types of bags could enlighten bag companies and consumers on design and purchase of the best type of bag for frequent use.

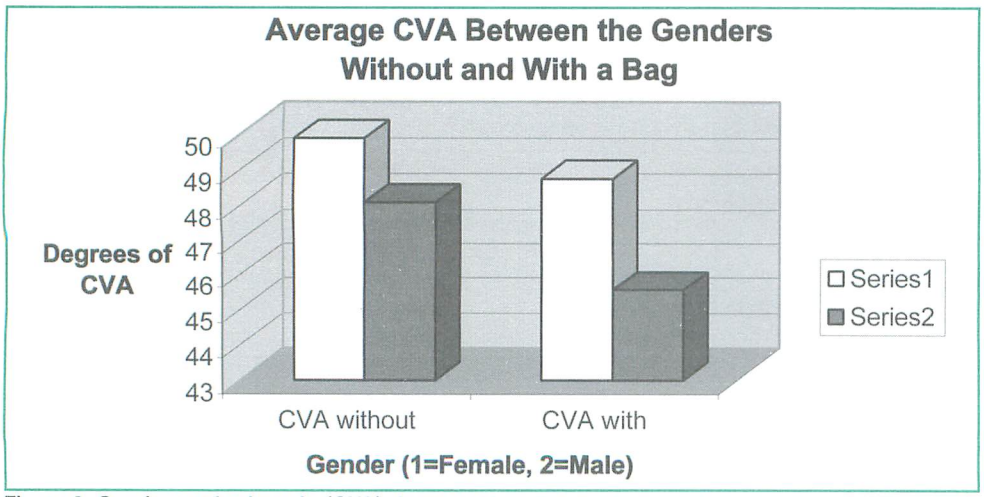

Figure 2. Craniovertebral angle (CVA) decreased as the subject carried a backpack or bag with both genders. Males had smaller degrees of CVA (ie, more forward head posture) both before and after carrying a backpack or bag compared to females.

Gender differences were remarkable. In this study, university males had more considerable differences with CVA as compared to the study by Wilmarth and Hilliard[7] with 4th grade students (see article in this issue) where females had a more significant postural change than males. The height and build of the college male is dramatically different as compared to preadolescent males. The males in this study did have a smaller CVA with and without a backpack or bag on compared to the females. The more forward head position of the males could be due in part to a combination of the following: their level of fitness and strength, particularly shortening of the anterior chest muscles, the placement of the bag higher on their torso, and their major course of study (fewer PT majors). As previously mentioned, the males' body weights were also generally higher than the females. While the self-selected bag weights remained relatively equal, the difference in body weights translated into a smaller bag percentage of total body weight value for the males.

On a gross level, males tend to be stronger than females as well.[18,19] The activation of voluntary muscular contraction allows males to exert more effort in carrying a bag, adding extra forces at the vertebral structures. This may manifest as a strained or stressed leaning or forward head movement to counterbalance a load located posterior to the body's center of gravity.

Also seen in the study was the relationship of an increasing backpack or bag weight to a lessening of the CVA and worsening of forward head posture. Combining heavier bag weights with a non-neutral CVA augments forward head positioning. Males started off with poorer posture, so adding any extra weight would likely augment that posture. Females' discrepancy in strength also places extraneous compressive stress at the vertebrae since their muscles cannot offer the support needed. The hormonal differences[18] in females could also cause other compositional changes in the spine, such as ligamentous laxity; these anatomical structures could fail if loads or bags are too heavy. This evidence can be useful for recommendations for proper bag weight in older, college-aged students.

As far as the subject's major at the university, PT majors exhibited more cognizance of posture. They had larger CVA values both before and after donning a backpack or bag when compared to their non-PT major cohorts. It is possible that the education and exposure they have to correct postural instruction could con-

tribute to a proper alignment. Perhaps increase of postural awareness could allow for conscious spinal proprioception. Physical therapy students are instructed that ideal posture places musculoskeletal structures in relative balance, allowing the muscles to function most efficiently with a minimal amount of effort.[20] Concerning the CVA, a textbook guideline is to have the ear lined up over the midline of the shoulder. Also, some physical therapy interventions that are taught during a university course of study include deep cervical flexor training, scapular and cervical stabilization training, correction of muscular imbalances about the cervical spine, and ergonomic postural evaluations.[20]

Some of the subjects did have histories of musculoskeletal issues, but none were exacerbated or observed at the time of testing. None of the subjects aggravated their symptoms while undergoing experimental procedures. It was likely that since these students carry a backpack or bag on a regular basis, they have either adapted to the additional loading or have found methods to manage any symptoms they may have during bag carriage.

One of the problems encountered during this study included the sample size, particularly with users of one-strapped bags. Since this low number decreases the power of the study, supplementary research is needed to scrutinize the use of a 1-strapped carriage mode and its affect on other dependent variables such as anterior trunk lean, trunk rotation, and scapular position. This would better elicit benefits of using one particular type of backpack or bag over another.

In the long run, postural habits may interplay with the development of musculoskeletal co-morbidities of the aging process. The incidence of osteoporosis and increased thoracic kyphosis with age in both genders could be amplified if incorrect postures occur earlier in life. The regularity of backpack or bag use among students can reinforce an unnatural postural assumption. Longitudinal studies would be noteworthy in the assessment of frequency of compression fractures in patients with a history of backpack use.

CONCLUSION

From this study, it was concluded that a male college-aged student in a non-PT course of study was more likely to demonstrate a greater change in head posture when carrying any type of backpack or bag. The number of straps used, body height, and the bag's percentage of total body weight did not influence the CVA or head-on-neck posture. However, heavier backpack or bag weight did worsen posture. Descriptive statistical evidence demonstrated a global increase in forward head posture when putting a backpack or bag on, but the significance remained only with males.

Additional studies that take into account other dependent variables in addition to CVA will assist in further defining the type of backpack or bag that when used on a daily basis results in the most optimal posture not only for college-aged students, but for students of all ages.

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The study was approved by the Northeastern University Institutional Review Board, Division of Institutional Compliance.

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Christine T. San Agustin and Jonathan Raymond were both students at Northeastern University during the time of this study. Mary Ann Wilmarth is Assistant Clinical Specialist, Department of Physical Therapy at Northeastern University and Timothy Hilliard is Assistant Professor at Northeastern University.

Our Kids, Backpacks, and the Back Epidemic

Marilyn Miller von Foerster, PT, MA

INTRODUCTION

In my 34 years of teaching back health and rehabilitation I have observed that lifelong habits of poor posture are a main contributing factor to back pain and disability. That is why I am committed to address these habits as early in life as possible. Poor posture includes such things as forward head, forward trunk lean, and associated short stride length which we see as tendencies in aging. There are numerous references in the literature linking backpack use not only to back pain and injury but to these posture and gait problems.[1-9] What alarms me now is how many children I see with posture and gait that we associate with 80 year olds and certainly with the majority of patients with back pain.

Since my son introduced me to the world of children 13 years ago, I have spent a good deal of time volunteering in schools. I have seen so many factors in the life of our school children which contribute to back disability that as a physical therapist I am appalled. I will share with you the problems I see and what I feel needs to be done to correct them.

FROM THE CENTER OUT

In my clinical approach I have always started at the center and worked out, while evaluating the individual as a whole. I am applying this same approach to our kids, backpacks, and the back pain epidemic.

School Chairs

Our children spend nearly 6 hours of their school day, sitting in bucket seats that have been designed for ease of stacking rather than for the humans sitting in them (Figure 1). In order to sit relaxed in seats like these, one must assume a posterior pelvic tilt and spinal kyphosis with forward head. If children plan to read or write at their desks, they must exaggerate these postural distortions even further (Figure 2). Teachers usually require students to sit back in their chairs for reasons of orderliness and safety—understandable priorities in our crowded classrooms—but in the typical school chairs the only way to sit with proper spinal position is to sit on the front edge of the chair so that your pelvis is free to rotate anteriorly on the femur to assume a neutral position. Most children instinctively try to reach this position (if there molding process is not too advanced already).

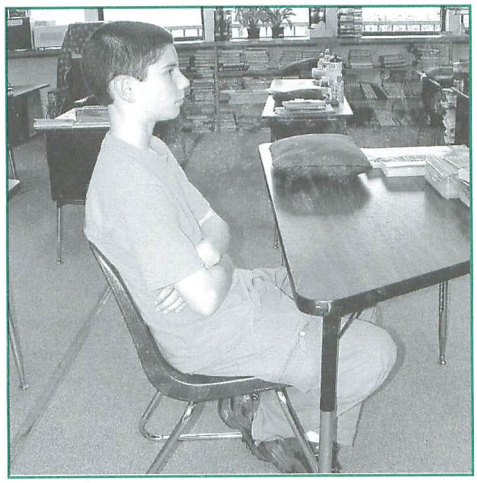

Figure 1.

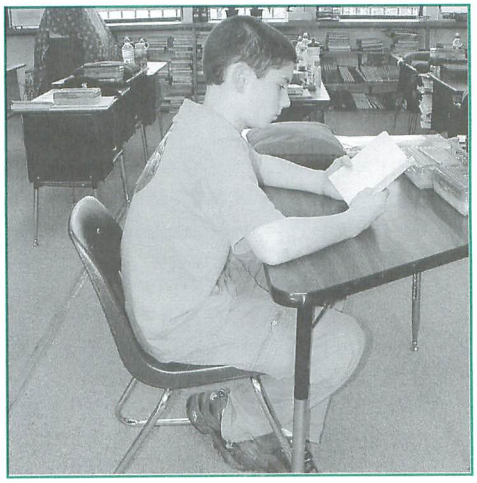

Figure 2.

Aside from the postural distortion created by these child-molding chairs, the hamstrings are put in a shortened position while seated at a desk, as are the hip flexors. The length of these two major muscle groups is crucial to proper spinal/pelvic posture and mechanics. When the children are allowed to elongate in stance, it is only for enough time to hurriedly don their backpack and rush to the next class or have a quick trip to the locker if they are lucky enough to have one. There is certainly no time for a thorough stretch of these shortened muscle groups. And, there is certainly no time and attention spent on getting one's head back on top of the spine in a vertical orientation!

Forward Heads

Heads are forward from hours in the chair, leaning over desks, hovering over computers (Figure 3) (while seated in other bucket seats or chairs that require a backward lean, as recommended by "ergonomists"), lounging in soft sofas at home watching TV, playing with Legos on the floor, etc. Children, and our entire society in general, spend so much time with a forward head that our brains adopt this as a new "normal" position. How many times have we heard from our patients when we correct their head position that "it feels unnatural, like I'm leaning backward."

Figure 3.

Backpacks on Top of it All

Upon these flexed spines, children don the backpack, which has for some reason become a standard school supply item. The horizontal forces of weight behind and straps in front over shoulders, dictate a forward lean and facilitate rounded shoulders and forward head (Figure 4). Now that we have our developing loved-one sufficiently slumped for a sufficient period of time throughout each day, we add a 20-pound load to the whole gravity challenge. This is imposed upon a rapidly developing skeleton that

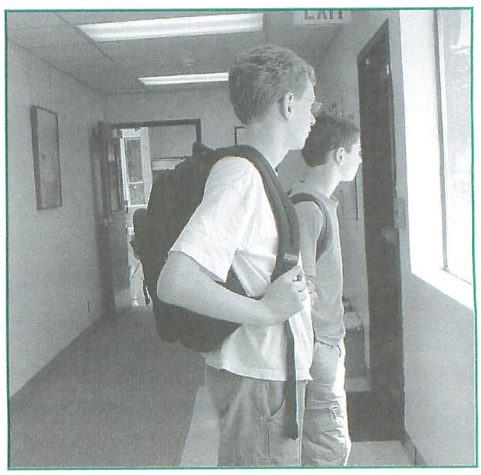

Figure 4.

will be shaped for a lifetime within these few years. All our children are victims of this disabling requirement. What are we as a society and a profession doing, tolerating this pattern?

WHY ARE OUR CHILDREN SO ATTACHED TO BACKPACKS?

If we really want to solve this backpack problem we must first analyze its cause, just as we do with our patients. I would like to first acknowledge the fine study of two Pacific University doctoral students of physical therapy, Jessica Johnson and Cathleen King, who analyzed many factors involved in backpack use in adolescence and especially the importance of studying specific age groups in order to best analyze and solve this problem.[10]

General observations I have made with my own child and his classmates as to why they use and misuse the backpack to the detriment of their bodies, despite all the advice from knowledgeable teachers and parents, has suggested the following reasons:

Convenience

- —They don't want to be caught without something important to have along so they keep much more than they need in the backpack. Therefore the weight of the pack increases beyond healthy limits.
- —It is awkward and time consuming to take it on and off so why not just keep it on therefore increasing the length of time carrying the load.
- —"Out of sight out of mind." Hand and arms are free for other activities and the backpack becomes in effect unconsciously grafted to the body, forcing our neuromusculoskeletal systems to make the necessary mechanical and physiological adaptations in order to continue to function with gravity.

Fashion

- —Coolness. Gotta wear the sag bag!
- —No student in their right mind would be caught without a backpack in school!
- —The kindergarteners want to be big and look like a real student.
- —Media and marketing make it cooler by the minute and by the dollar. Marketing sophistication is way beyond the influence of parents and certainly beyond their pocketbooks.

Required Equipment

- —Many schools include backpacks in their school supply list.

SO WHAT CAN WE DO ABOUT IT?

"Form Follows Function"

We all know that the human body is designed to stand vertically. Physical therapists know what good spinal position is (though amazingly controversial these days!), and that its most efficient loading is as close to vertical, or spinal elongation, as possible. We need no elaborate research efforts to convince us that the best way to carry a load is close to the spine, the best way to use our legs properly in gait is with vertical posture, the best way to reinforce and train a movement is to give it resistance and repetition in the direction as similar to the desired movement and function as possible. As we train people to reach their highest functional levels we guide them to experience this relationship of their body with gravity. Our children all have this relationship in its purest form when they begin walking, balancing their heavy heads. I have included a diagram illustrating the horizontal and vertical components of forces associated with backpack carrying (Figure 5). The sketch illustrates why the forward pull of the shoulders is necessary to balance the downward pull of the backpack load.

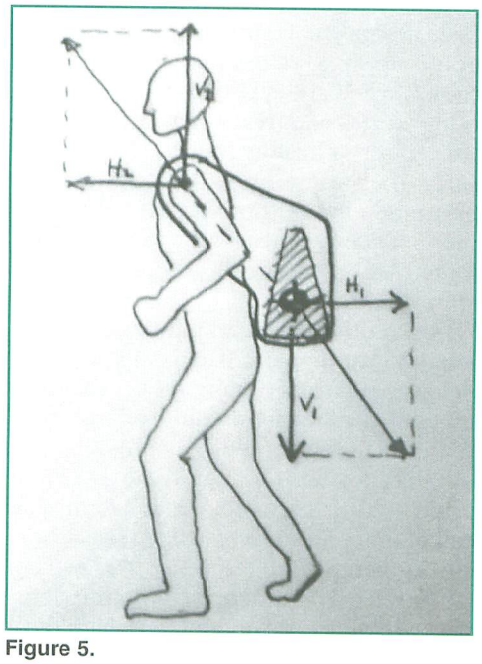

Figure 5.

Load Axially

The human body is its own load, ie, mass and gravity. How is it made to work with its weight? It is made to work vertically in partnership with gravity. So shouldn't we complement this already perfect design by keeping the load vertical and not messing it up! We should look at our toddlers and our wise native brothers and sisters and use our heads to balance our axial loads, as they have done for centuries.

Are we victims of fashion too? Our first reaction when someone in our culture places something on their head — laughter! We think they are being silly. Well it's time to get serious. And don't underestimate our children's wisdom. When given the facts about themselves, their bodies, and peoples of this earth, kids will want to make the right choices, especially if they are part of the creative solution process—and know that they are helping their own loved ones by their example and their ideas.

Horizontal versus vertical

Look at our classrooms, our daily lives, our chairs, our loads. Do they complement this vertical effort or do they change the direction of our human movement and posture toward the horizontal activities of our lives—driving, computer work, watching TV? In my experience the only effective way to train good posture is to do proprioceptive neuromuscular facilitation for axial extension. This can be done with any head carrying exercise or device that is of minimal but sufficient weight to proprioceptively facilitate, once the individual assumes full axial extension and optimal spinal posture, which can be measured by CV angle measurements.[11] This often requires extensive retraining to overcome decades of poor postural habits.

People of the World

Why don't we join the rest of the world and carry loads as they have been doing for centuries, from the head and/or with balanced axial loading over the shoulders? They must use their bodies properly for survival. They cannot rely on technology to do the body's work, and they have no worker's compensation for back disability.

In plains regions such as in Africa, many natives apply a twisted rag in a donut shape as a base for carrying objects directly on the head. In mountainous regions requiring constant travel on inclines, people use a tumpline (head strap) system with a basket on the back (see Figure 6). In 1983 when visiting Nepal with our beloved colleague, the late Sarah Semens, I personally experienced the Nepalese carrying system for 2 weeks by employing it myself. I also met with an orthopaedic surgeon in Kathmandu who expressed amazement that the Nepalese people who carry very heavy loads in this manner for days at a time, do not have the back problems so common in our society. Needless to say,

Figure 6.

they begin postural training by necessity at a very early age.

When speaking in classrooms, I bring slides of people around the world to demonstrate how we are all part of the human family and how we have much to learn from those less "privileged" than we. This has been an enormous breaker of the fashion and vanity consciousness that especially influences adolescents. It gets them excited and expands their awareness of design possibilities.

ACTIONS I HAVE TAKEN

My crusade began when my son was in the fourth grade. The class was studying comparative skeletal anatomy, and when they got to the human, the teacher asked if I would cover that area. I took the opportunity to teach about why we were designed as we are and how to respect and care for that design, posture first. I provided small travel cushions for the children's chairs so they could experience correct and incorrect sitting posture. They used them for the rest of the year and experienced how much better their backs felt. I notified our local newspaper about the project. The editor did a very informative and fun article using photographs of the children. She was happy to have me do most of the writing so the information would be correct. These cushions by the way are a simple remedy for the bucket seats, short of replacing them. I have arranged for all the classrooms I have been involved in to purchase these cushions at a discounted rate.

I discovered several years later that the fourth-grade was an ideal time to start the posture and back health awareness education. Fourth-graders are open to ideas and less affected by the many physiological and social concerns of adolescence that limit attitudes about their bodies.

I continued working with each of my son's classes, now approaching the eighth-grade. Our local newspapers and television stations have been interested in each class project. This has been a real validator with the kids and the community, as well as just exciting and fun. It has also been useful as carry over information for the students from year to year.

In one fifth-grade class, I involved the students in evaluating several chair samples to advise the principal in what chairs he should order when chairs were to be replaced. I also photographed the children in sitting posture at their desks, before and after training. This posture awareness project with all 60 fifth-graders of the Nestucca Valley School District was shown on big-time Portland network news, a huge thrill for the students of our small rural community on the Oregon Coast.

At the end of the project, I gave them copies of the photos so that they and their families could visualize the subject and practice at home. Photos are especially valuable as teaching tools because there is so little time and attention available in the classroom for outside people such as us.

I also involved the students in book bag design brainstorming. Here they could apply to a real-life situation what they learned about the basics of how the body works, with respect for the spine as the center of healthy movement and posture. They came up with "right on" suggestions. One of these is also my recommendation: bilateral shoulder bags joined like a vest with an optional head strap.

Currently I am working on an attachment to the present backpacks that will decrease the horizontal vector and include the head for some of the load, which facilitates axial extension and optimal posture. If any of you are interested in my backpack attachment you can contact me. Maybe some researchers among you would like to use it in a study.

I have included "Guidelines for Backpack Use" in Appendix 1; a handout I put together for students, parents, local doctors' offices, etc. I made it available to parents, students and teachers in local schools during the registration and orientation periods and throughout the year.

When Sharon Kitzhaber, a physical therapist, was First Lady of Oregon, I wrote to her for her input regarding my concerns about the spinal health of our school children related to poor postural habits. She recommended I speak with the Physical Education Specialist of the Oregon State Board of Education, Margaret Bates. After an afternoon of interesting exchange of ideas and information, she suggested I write an article for the professional journal of Oregon physical educators. See Appendix 2.

FURTHER ACTIONS WE CAN ALL TAKE IN OUR COMMUNITIES

- Collaborate with your local Pediatric Orthopedist to expose these problems to your community from a broad medical perspective.
- Go into the classrooms, volunteer to help. While you are there, notice all the other factors in addition to backpacks that contribute to the back pain epidemic.
- Offer to do a posture class in the classroom or instruct teachers in the basics to share with their class and incorporate into daily classroom good habits.
- Meet with physical education and classroom teachers. At first I had thought that PE was the class in which to teach posture and body mechanics, but then I realized that the instructors only have a very short time with each student, and maybe only two classes a week. Since it is really daily habits that we need to address, I now think back health habits are best brought into the classroom. Present them in a way that benefits teachers as well. Everyone needs to stretch throughout the day and the students and teachers will work better, and with a more positive attitude if their bodies are not being abused at the same time.
- Find out how the chairs are ordered, what catalogues, who orders, the criteria they use, etc. and offer to educate and help with the selection of chairs.
- Contact vendors and school chair designers, schools of industrial design, etc. Educate them in the importance of fostering good posture with design.
- Coordinate PTs and OTs in your school district to demonstrate our professional commitment as a team to address issues that affect lifelong spinal health.
- Contact your legislators. Legislation is proposed in California regarding backpacks. Lead that process in your state. Los Angeles County schools employ physical therapists to oversee the ordering of furniture and to properly adjust it to the students.
- Best of all, teach children what to be aware of at school and at home. Teach

them to feel and learn healthy posture through their neuromotor system, and how to properly stretch the muscles that are shortening while just being a student. Teach them the mechanics of backpack use and have them design a better system for carrying books. They love learning and creating solutions to their own problems. Most of them will have an emotional involvement with the problem since the majority of families have someone who has suffered a lot with back pain, has been crabby, unable to work, and unable to play with them due to back pain.

- Get the media involved.
- Write the Surgeon General.
- If all else fails...use the legal system!!!!

But once again, let's remember to go to the CENTER first. You can't correct all of these problems fast enough anyway, so take a deep breath and start with one. If you are a parent you can do something about the health of your own child now. I sometimes spend too much time with the big problems of our society instead of addressing the problem right in my own household.

Here is what we work on at home to keep our child orthopaedically healthy:

ACTIONS ON THE HOME FRONT

- Practice good posture: when sitting, standing, sleeping, reading, playing Legos, eating at the table, etc. Use occasional posture checks such as standing against the wall to learn how it feels to be vertical or lying flat on the floor, so the head can learn proper alignment with the spine.
- Our son especially loves sports so we demonstrate how these posture principles improve all athletic performance. Build on your child's personal interests.
- Eliminate leaning onto elbows whenever possible, especially while eating.
- Encourage frequent change of positions and know what positions to get into that "undo" the position he may have been in for a long time, eg, with Legos on the floor or computer activity.
- A written Home Exercise Program!! of appropriate stretches (hamstrings, hip flexors, thoracic spinal extension), and strengthening exercises (sit-ups, pull-ups, handstands, leg strengthening, etc).
- Head-carrying activities whenever possible.
- Experiment with carrying systems other than a backpack.
- Solicit his suggestions of how we all can improve our postural habits and encourage ideas from him of other stretches and strengthening exercises to do.
- Play games like keeping a balloon off the ground or batting it back and forth, volleyball, head carrying relays, pull-up contests, etc.
- Share clinical examples of disabilities from postural disorders, and comments from patients, such as "if only someone had told me this 40 years ago."
- Learn about carrying methods of people around the world who must use their bodies correctly for survival.
- And most important of all, BE AN EXAMPLE. We imitate one another.

SUMMARY

GET RID OF BACKPACKS for school use. They were originally designed for mountain climbers, whose hands are occupied and who are bent forward to climb an incline. Somehow the market spread to children for school supplies, and now backpacks are fashion statements. (Check out fashion and posture since the 70s, the post-Backpack Era vs. pre-70s, the pre-Backpack Era, in films, cartoons, magazines, commercials, etc.)

LOAD AXIALLY. If we need school bags at all (which is certainly questionable for kindergarteners and first graders), they should allow the weight to be evenly distributed on both sides and as close to the spine as possible to facilitate axial extension. Learn from native populations around the world who depend on their bodies for survival, instead of the conveniences our prosperity provides. They are the authorities in body mechanics. They use their heads and balance their loads. Teaching habits of healthy aging, beginning with our children, is the professional challenge of our day.

LET'S BE AN EXAMPLE. We must be able to show what we know if we want to teach it. I am proud that Physical Therapy is taking a leadership role in educating the public so all people can be as healthy as they were created to be. This must continue to be our focus.

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Marilyn Miller von Foerster, MA, PT is in private practice in Neskowin, Oregon. She works with clients in their own environment teaching back education and habits for healthy aging.

Appendix 1. Backpack Heads-up

GUIDELINES FOR BACKPACK USE FROM THE AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS

1. Don't let your backpack's weight exceed 20% of your body weight (less for a young child).***
2. Use a hip strap for heavier weights.
3. Use a backpack with wide, padded straps and a padded back.
4. Use both of the backpack's straps, firmly tightened, to hold the pack 2 inches above your waist.
5. Engage in exercises to condition your back muscles. Ask an orthopaedic surgeon or physical therapist for advice.***
6. Use the correct lifting techniques; Bend with both knees keeping a straight spine when picking up a heavy back pack.***
7. Place the heaviest items close to your back.
8. Pack your backpack neatly, and try to keep items in place.
9. Try to make frequent trips to your locker, between classes, to replace books.
10. Consider purchasing a backpack with wheels.
11. Purchase a second set of books for home.

***EXERCISES AND FURTHER TIPS FOR HEALTHY BACKPACK CARRYING

from Marilyn Miller von Foerster, Physical Therapist

Never add a load to a slumped spine. Keep your heart and head high, especially when you are lifting or carrying.

When loading and unloading your backpack, place it on a waist-high platform like your desk, rather than the floor, using your legs with a straight spine to lower yourself to the load.

Use a head strap to take some of the weight off shoulders and help maintain good posture.

Condition your back with such activities as:

- swimming (backstroke and breaststroke);
- jumping jacks, pull-ups, archery;
- overhead presses with light weight such as 2 books; and
- holding a book on the head with tall posture and slowly sit and stand from a chair 10 times.

Have a great year and a tall and healthy spine!

<This is the reverse side of the previous page; the two pages make up the backpack handout>

URGENT

WE ARE TAKING ACTION NOW AND NEED YOUR HELP

Medical research has identified extensive backpack use as a major contributor to poor postural habits, which if not corrected, will lead to a lifetime of recurrent pain and increased risk of injury and disability. More and more students are requiring physical therapy for shoulder and back pain related to both carrying the backpack and putting it on and taking it off.

The problem is especially urgent and serious for kids in middle school since the skeleton grows most rapidly and develops most permanently on people between the ages of 10 and 14.

There is no "good" backpack for carrying school books because the weight is distributed in a way that requires the student to lean forward to balance the weight, and to twist and bend with it loaded in order to take it on and off. Wheeled packs are some help, but often still requires lifting onto the back to get on and off the bus with an instrument etc.; the wheels make the pack heavier. My son went through three backpacks in our effort to find the healthiest situation. None was significantly better then the next.

WHAT WE CAN DO:

In addition to the guidelines on the opposite side of page, there are other bag systems that would help. Ideally the weight should be as close to the spine as possible, balanced, and complement good posture. As people in the third world demonstrate, head-carrying is the best way, according to the design of our skeleton. The next best is equal weight on both shoulders, as in two equal bags with wide straps evenly loaded. The third is a strap diagonally across the chest with the bag against the back. In many cases, arm-carrying may be preferable to using a bag at all.

I am currently working with students and staff in several schools to reduce the backpack problem. The students themselves are involved in the problem solving and research. Staff and students will learn how to use their bodies properly. We will also explore ways to reduce the need to take books home and develop alternatives to backpack use.

If you would like to help solve this problem or simply to discuss the issue please contact me.

Marilyn Miller von Foerster, PT at 503-392-4600, FAX: 503-392-4672
e-mail: mmillervf@oregoncoast.com
11/18/2002

Appendix 2. ***An Address to Physical Educators of Oregon***

POSTURE: THE FOUNDATION FOR FITNESS

Fitness requires movement. Movement is generated by muscles working together within our bony skeleton. Proper posture means our skeleton is aligned in a manner that provides for movement efficiency and grace with minimal risk of injury; the way we were designed to move, sit, and stand.

We all should be dedicated to the promotion of lifelong fitness based on movement. The most common cause of movement impairment in adults is musculoskeletal, especially postural low back pain. Rehabilitation and prevention of these injuries begins with teaching correct posture and good execution skills. Thank you Tiger Woods, Michael Johnson, and the late Florence Griffin-Joyner (to name a few) for demonstrating what excellent posture can do for performance.

Too often we take good posture for granted, especially in children, as something that is natural. But as our culture has become more sedentary, posture has become more dysfunctional, molding our bodies to the furniture we relax in. In earlier times good posture would have been natural for an active child, but in today's world of fashion slouch, computers, television, poor school chairs, and deep couches, we have to teach how to sit, stand and move properly.

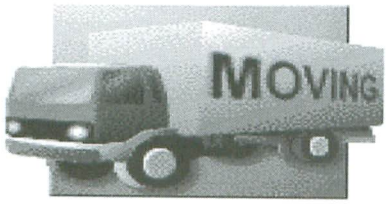
The back pain epidemic is now reaching our children at an alarming rate. Our schools impose several obvious and not-so-obvious challenges to back health: (1) many schools no longer provide lockers, requiring children to transport their heavy books in backpacks much of the day; (2) School chairs are well designed for stacking but poorly designed for sitting, contributing to a slumped posture when doing desk work; (3) Physical Education (PE) is either nonexistent in schools or, when offered, seldom teaches musculoskeletal fitness, good posture and healthy movement habits.

Our public education system should prepare our children for the future. If children begin having back pain at age 11, imagine how they will fare as adults! If PE can teach movement skills and habits that will have long-term benefit, the public will want to support such valuable and essential education, and parents will also benefit by learning from their children.

During World War I, physical therapy in the United States grew out of physical education in order to meet the urgent needs of our war-injured men and women. As our needs change, our professions must continue working together to meet the changing movement needs and problems of our society.

Postural awareness and performance training are needed more than ever as basic components of the PE curriculum. Simple modifications of existing exercises and posturally oriented games can be enormously effective in teaching posture awareness. I would like to see our professions join together for the postural fitness of our country, starting with our children. Your local Physical Therapy Association has resources to help.

Marilyn Miller von Foerster P.T.



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Thank you!

Occupational Therapy National Awareness Campaign to Promote Health in Student Backpack Users

Karen Jacobs, EdD, CPE, OTR/L, FAOTA

INTRODUCTION

In the United States, it is estimated that more than 40 million youths carry their school materials in backpacks.[1] Everyday these youths carry backpacks filled with books, bottles of water, laptop computers, athletic equipment, and other items that create a strain on their growing bodies. While there is a paucity of research on backpacks and students, there is much anecdotal reporting on the extraordinary problems that children are reporting as a result of their backpacks. While more research is underway to study the issue, the dangers of taking no action would be irresponsible. And while some public information and education efforts have been undertaken by several health organizations, the sustained educational efforts on the part of the American Occupational Therapy Associ-ation (AOTA) on this issue has begun to make a marked difference in public awareness.

COLLABORATION

The American Occupational Therapy Association (AOTA), based in Bethesda, Maryland, first spoke out on school backpack awareness in August 1997, when the issue was included as a topic of interest in a back-to-school media advisory about how occupational therapy helped children with their 'occupations' as students. The topic generated strong interest from reporters all around the country. In 1998, 1999, and 2000, AOTA's public affairs office increasingly promoted the information in a web-based (www.aota.org) tip sheet as a resource to media all year round, but especially in the fall as a back-to-school item. Each successive year resulted in more mentions of AOTA or occupational therapy in conjunction with stories about backpack use by children. Backpack information was also included in AOTA's April *OT Month* materials, and AOTA members were encouraged to use the issue as a focal point for promoting occupational therapy's role with children's health issues.

Concerned that increasingly heavy school backpacks may be putting schoolchildren at risk of long-term health problems, in 2001, AOTA teamed up with the L.L. Bean Company, of Freeport, Maine to raise awareness about safe and healthy school backpack use. L.L. Bean, Inc., founded in 1912, is a leading retailer of apparel and gear, such as school backpacks for men, women, and children.

AOTA, Inc. was a natural choice for the partnership with L.L. Bean because so many occupational therapy practitioners are already working with and are familiar with health issues facing children and the company had become concerned that loading too much into a school backpack could potentially lead to injuries or just be uncomfortable to the user.

The American Occupational Therapy Association was founded in 1917 and about 40,000 occupational therapy practitioners and students are members. One-fourth of AOTA's members work with children, in schools and pediatric units of hospitals on a daily basis, bring practical solutions to ergonomics issues. Occupational therapists and occupational therapy assistants are trained in helping children with a broad range of issues. In addition to proper school backpack use that can affect a child's performance and health, occupational therapy practitioners address proper computer use, handwriting, and behavioral problems.

Outcomes of the Collaborative Process

As part of the partnership between AOTA and L.L. Bean, both organizations in the fall of 2001 launched a more intensive public information and education effort to promote the safe use of school backpacks. The national public information campaign on promoting healthy backpack use began with the development of a brochure, hangtag, video news release, sample talking scripts for presentations, and sample press releases for the print and broadcast media. AOTA and L.L. Bean collaborated to produce a brochure with tips for properly selecting, loading, and wearing a backpack (Figure 1). This brochure has been distributed in L.L. Bean stores, mailed with their catalogs, and placed on both organizations' web sites for easy download: www.llbean. com and www.aota.org. A consolidated version of the brochure appears on all hangtags attached to L.L. Bean school backpacks.

Audience Viewers for Television

In the fall of 2001, AOTA produced an approximately 2-minute video news release (VNR) on backpack safety with partial funding support from L.L. Bean. The VNR was released nationally and aired on 81 local and national broadcast stations to 3,795,000 viewers (AOTA, 2002). The VNR aired in 5 of the top 10 major media markets including New York, Los Angles, Chicago, Philadelphia and Washington, DC (AOTA, 2002).

Audience Viewers for Newspapers

AOTA also promoted the issue of school backpack safety in small and mid-sized newspaper markets through paid media. The Association wrote an educational article about school backpack safety—an article that was placed in 212 local and national newspapers, including daily, weekly, monthly and special interest publications. The total readership was 18,539,804 (circulation not available for some newspapers). The placement was in 30 of the top 50 markets.[2]

Content Analysis

In total, the national public information campaign on promoting healthy backpack reached approximately 23 million people through coverage in 212 newspapers and 81 television stations.[2] Approximately 91% of the newspaper articles included the campaign message that: Backpacks that are excessively heavy or carried incorrectly may cause significant pain and injury to growing bodies and that to reduce the risk of injury, parents should monitor the weight of the backpack and how their children load and carry them. Nine percent were clips that directed the reader to view AOTA, Inc. and L.L. Bean's web sites for more information on backpack safety tips.[2]

NATIONAL SCHOOL BACKPACK AWARENESS DAY

To build on the success of the 2001 backpack campaign and to broaden the educational reach of the effort more directly to students, parents, and schools, AOTA developed and implemented National School Backpack Awareness Day in September of 2002. National School Backpack Awareness Day was conceived as a 1-day event to educate parents, students, school administrators and teachers, and the general public (through the media) about the proper use of backpacks

The brochure was designed to address 3 important factors in school backpack use: selecting a pack, loading a pack, and wearing a pack.

Selecting a pack

Choose a pack that's appropriate to the child's size and age. School backpacks come in different sizes for different ages.

Select a pack with well-padded shoulder straps. The shoulders and neck are rich in blood vessels and nerves that when constricted can cause pain and tingling in the neck, arms, and hands.

Choose a pack with a waist belt to be fastened for extra support and to help transfer the weight from the shoulders to the body's trunk and hips.

Consider a pack with reflective trim to increase visibility of kids who carry the school backpack in the evening.

Pack items neatly and organized to keep books and materials from sliding around in the pack, shifting the weight.

If a pack is too heavy, consider using one on wheels.

Wearing a pack:

Always wear both shoulder straps to distribute weight evenly.

Wearing a pack slung over one shoulder can cause a person to lean to one side and curve the spine.

Adjust the shoulder straps so that the pack fits snugly to the child's back. A pack that hangs loosely from the back can pull the child backwards and strain muscles between the shoulders.

The bottom of the pack should rest in the curve of the lower back. It should never rest more than four inches below the child's waistline.

When shopping for a school backpack, take along books and other materials that the child would carry to judge how each pack varies when fully loaded.

Loading a pack

Never allow a child to carry more than 15% of his or her body weight. That means a child who weighs 100 pounds should not carry a school backpack that weighs more than 15 pounds.

Load heaviest items closest to the child's back.

Figure 1. Contents of Backpack Brochure

Figure 2. Photographs from The American Occupational Therapy Association (AOTA) National School Backpack Awareness Day 2002

and the health risks of improper use. The event consisted of "weigh-ins," where students and their backpacks were weighed to see whether backpack weight was in the recommended range (*no more than* 15% of student bodyweight). Educational materials were provided on the proper use of backpacks to avoid pain and injury for parents, students and schools.

Desk side briefings were held 10 days before the National School Backpack Awareness Day to alert national print and internet-based media of the upcoming event and to educate them on the larger set of ergonomic risk factors facing school children today.

AOTA initiated and drove events in schools in 4 major media markets. Additional events, initiated by individual occupational therapy practitioners and students, were held in other cities and states in schools and community venues. The event was held on September 25, 2002 to coincide with back-to-school issues. Events were held in 29 states plus the District of Columbia and the island of Bermuda, and in 98 locations. Although National School Backpack Awareness Day focused on a single day, it also sparked educational events by occupational therapy practitioners and students for months following the event.

The National Parent Teacher Association (NPTA) was approached to partner with AOTA in distributing Backpack Awareness Day educational materials to their membership, and lending the name of their organization to the initiative. They provided communications support including on-line information to their membership.

Audience reached (as of October 16, 2002)

Total measured circulation of publications placements comes to more than 1,096,000 readers. On-line coverage resulted in more than 26 million page views. Broadcast coverage (not tracked) added millions more individuals reached.

Media messages

AOTA and occupational therapy were given *high/frequent* mention in the media. National School Backpack Awareness Day was given *high/frequent* mention in the media. Backpack strategies for parents and children and for schools were given *strong mention* and were included as lists in the bodies of stories or as sidebars to stories.

Web Site Visitor Sessions (excluding in-house AOTA usage)

Of the 60,407 visitor sessions to the AOTA website in September 2002,

approximately 7,500 (12.4%) of those visitor sessions were to the School Backpack Awareness Day microsite.

There was a modest increase of visitor sessions during the week of the September 25 event, up approximately 300 from the previous week. However, the greatest activity on the microsite in terms of visitor sessions overall was from mid-August through mid-September (the speculation is that this is the period of time people would have been reading the materials to decide whether or not to hold an event, and then revisiting to download or print the materials to use for the event).

Within the Backpack microsite, the Community Toolkit was the most frequently viewed item. From mid-August, when the section was first promoted in AOTA's *OT Practice* and in the AOTA *One-minute Update*, an electronic news update for AOTA members, through the end of August, there were 1,200 visitor sessions in the Toolkit. The Spanish-language student permission letter ranked 16th out of 31 most requested pages in the Toolkit in viewer sessions the week before the event. During the week of the event, the Event Art area of the Toolkit was the second most accessed area of the microsite.The week before the event, it was the sixth most accessed area; the week following the event it was the third most accessed area.

Partnership Results

L.L. Bean installed a link from the llbean.com site to the National Backpack Awareness Day site at www.aota.org.The link remained on the site until September 25, 2002. The link also was installed on the bookpack guide, one of the most popular areas of the llbean.com site during the back-to-school and fall season.

On September 16th, L.L. Bean installed graphics based on the AOTA Backpack Day posters in the bookpack areas of their 5 retail stores, prominently displayed. The stores are located in Freeport, Maine (the flagship store and L.L.Kids Store); Tysons Corner Center, McLean, Virginia; The Mall in Columbia, Maryland; and The Promenade at Sagemore in Marlton, New Jersey.

The National Parent Teacher Association (NPTA)

NPTA sent a message about National School Backpack Awareness Day in their weekly e-mail newsletter in mid-September that reached 12,000 Parent Teacher Association (PTA) affiliate members. The message included a link to AOTA's Backpack Day website. NPTA placed backpack information on their "Parent Involvement: Health and Safety" section of their website and also included a link to AOTA's site. Finally, they provided a statement expressing support for educating parents and schools on the issue for AOTA to include in the Backpack Day media releases and other media materials.

CONCLUSION

The partnerships established between AOTA, L.L. Bean, and NPTA are good examples of the fruits borne by a social marketing, an approach that one uses to effect behavioral change on the part of the target audience. Free tips on backpack safety are available on the AOTA, L.L. Bean, and NPTA web sites, brochures and hang tags on L.L. Bean school backpacks, a video news release on backpack safety, and a syndicated news release on promoting backpack safety. Schools, parents, and students are provided with tips for choosing, loading, and wearing backpacks in ways that are safe and healthy.

National School Backpack Awareness Day also served as an opportunity to broaden awareness of occupational therapy.The events served to put hundreds of occupational therapy students out in the community, promoting their profession within a successful setting. Through the media, millions of people increased their awareness of the health impact of school backpacks and made the link between occupational therapy and the health and well-being of children.

The campaign was conceived as a first step in a larger effort to engage the profession and communities in an event to help safeguard their children, to build brand for the event in future years, and to use this event as a means of broadening the national discussion about steps that schools and parents can take to protect the health and well-being of our nation's children.

ACKNOWLEDGEMENTS

Special thanks to Jeff Finn and Brynda Pappas for their invaluable feedback.

REFERENCES

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Karen Jacobs is the Clinical Professor at Boston University Sargent College of Health and Rehabilitation Sciences, Programs in Occupational Therapy in Boston, MA.

Field LD, Savoie FH. *Master Cases in Shoulder and Elbow Surgery.* 2003. Thieme, New York. 434 pp., illus.

Great strides have been made in the surgical management of shoulder and elbow conditions through the past 20 years. An improved understanding of the pathophysiology and biomechanics of these joints, coupled with new surgical techniques and innovative technological advancements, have resulted in more effective treatment of these musculoskeletal conditions. As an example, the advent of arthroscopic surgery has significantly enhanced management of many shoulder and elbow conditions with reduced morbidity and functionally superior rehabilitative outcomes.

Master Cases in Shoulder and Elbow Surgery presents 56 surgical case studies involving shoulder and elbow diagnoses that are common in most orthopaedic surgery practices. These are organized into 13 sections. Specific diagnostic sections include: (1) Shoulder Fractures, (2) Shoulder Instabilities, (3) Rotator Cuff Disorders, (4) Osteoarthritis Shoulder Disorders, (5) Miscellaneous Shoulder Disorders, (6) Suprascapular Neuropathy, (7) Elbow Fractures, (8) Elbow Instabilities, (9) Tendinopathies of the Elbow, (10) Arthritis and Bursitis of the Elbow, (11) Arthrofibrosis of the Elbow, (12) Neuropathies of the Elbow, (13) Miscellaneous Elbow Disorders.

Each case study begins with patient history and physical examination, differential diagnosis and radiologic findings that, together, determine the medical diagnosis and subsequent surgical intervention. Surgical and postoperative management techniques are then outlined in detail followed by a brief discussion and suggested alternative methods of management including advantages and disadvantages of theses treatment options. Additionally, a unique and useful section on 'Perils and Pitfalls' allows the physician to pick up some tips or new techniques offered by other surgeons. A listing of suggested readings follow each case study to provide the reader with additional resources.

Master Cases in Shoulder and Elbow Surgery would appeal to surgeons and rehabilitation professionals. The text is concisely written and the glossy pages contain many photos, diagrams, radiographic pictures, and surgical illustrations that effectively clarify the somewhat technical written information. Physical therapists will benefit greatly by using this text as a reference for diagnostics, surgical repair, and optimal treatment interventions, all of which will enhance their knowledge base and contribute to improved rehabilitation outcomes. This is a 'must-read' resource for the physical therapist practicing in postoperative upper extremity rehabilitation. This text would be a valued addition to any clinical resource library, providing the orthopaedic clinician with diagnostic-specific, current surgical information, adding insight when developing postoperative rehabilitative goals and treatment plans.

Roberta L. Kayser, PT

Lee D. *The Thorax: An Integrated Approach*. White Rock, British Columbia; 2003. 144 pp., illus., with accompanying CD-ROM (Minimum Requirements: PC Pentium 166 or better; MS Windows 95/98/NT/2000; SVGA 800x 600).

The primary objective of this book is to provide an updated approach to assessing and treating dysfunction of the thorax. This second edition builds on the framework of the previous first edition and advances the concept of the Integrated Model of Function. The author is a Canadian physical therapist involved in clinical practice, education, and research.

The text is divided into 7 chapters. The first chapter describes in detail the anatomy of the thorax. The chapter is organized into osteology, arthrology, and myology of the thorax. The author defines and classifies the myology section into local and global systems, which are part of the Integrated Model of Function. The author uses some excellent reprint images from Primal Pictures to visualize parts of the muscle system. All figures and relationships are well described.

The second chapter is one of the more important chapters in the text. The author introduces and describes the principles of the Integrated Model of Function. This construct appears to be the central framework on which much of the book is written. The model is an extrapolation of the scientific and clinical studies of the lumbopelvic region and has been adapted for the thorax by the author. The chapter describes the following components of the model: form closure, force closure, motor control, emotions, and awareness. Each of the components are operationally defined and described. Cadaver photos and figures illustrate presented concepts. The motor control and the emotions/awareness components are less descriptive than the other components and further discussion of these important aspects would be desirable.

The third chapter describes the various theories on biomechanics of the thorax. A thorough literature review is presented on the topic. Discussion and illustrations of the mechanics are well described. The author does a remarkable job describing the complex biomechanical relationships in the 4 thoracic regions and clearly delineates between evidence-based information and clinical reasoning and observation.

Chapter 4 of the text focuses on diagnosis of thoracic dysfunction. Subjective and objective examinations are presented. The bulk of the chapter deals with testing and examination of each region of the thorax including: functional movement tests, passive mobility and stability testing, neuromyofascial and force closure testing, and neural mobility testing. All of the tests are well presented and defined. The CD-ROM that accompanies the book demonstrates all the tests in the book with extremely clear video but audio is not present. This is a wonderful way to communicate the complex psychomotor aspects of examination and treatment. The subjective examination is adequate but this text does not go into differential diagnosis of thoracic pain.

The fifth chapter is an outline of the author's classification system for thorax dysfunction and is only one page. The sixth chapter is a summary of clinical findings of the classifications of dysfunction and descriptions of mobilization, 'decompression techniques,' and manipulation techniques for the different types of dysfunctions. The CD-ROM also demonstrates each of the techniques described in the text.

The final chapter introduces the motor control and force closure component for the thorax. Concepts of load

transfer in optimal and dysfunctional thoracic states are presented. Stabilization exercises for lumbopelvic and thoracic spine are demonstrated as well as progressions for global muscle systems are described. This section includes highlighted areas for therapist facilitation, manual and verbal cues, and key points of control.The exercises are fully demonstrated on the CD-ROM.The concepts of the book are well integrated into this chapter.

Overall, I would highly recommend this book for any clinician interested in manual therapy of the spine and rib cage. This is an excellent teaching reference for physical therapy students and experienced clinicians alike. The text is visually appealing and the accompanying CD-ROM sets a new standard for similar textbooks. The strengths of the text are an updated discussion on thoracic dysfunction and its treatment; the use of CD-ROM technology to demonstrate assessment and treatment techniques; and the integration of new models of function. The author is to be congratulated for an excellent contribution to the literature.

Timothy J. McMahon, MPT, OCS

McGinty JB, ed. *Operative Arthroscopy.* 3rd ed. Philadelphia, Pa: Lippincott Williams and Wilkins; 2003, 995 pp. with accompanying CD-ROM, illus.

The intent of the third edition of *Operative Arthroscopy* is to bring together leaders in the field and develop a textbook that serves as a compendium of the various operative procedures available to orthopedic surgeons. As noted in the preface, this text is intended for surgeons who are experienced arthroscopists and those wishing to learn the necessary skills. The vast majority of the 105 authors are orthopedic surgeons, most of who are highly respected in their field.

The book is comprised of 67 chapters divided into 10 sections. The first 3 sections include arthroscopic history and development, basic science, and arthroscopic anatomy. The next 7 sections are devoted to arthroscopy for knee, shoulder, elbow, wrist, hip, foot and ankle, and low back disorders. The most extensive sections relate to the knee and shoulder, as 31 chapters are included in these 2 sections. Particularly informative chapters are those that deal with arthroscopic anatomy of the knee and ankle, meniscus repair and replacement, treatment of complex articular surface injuries of the knee, pathophysiology and repair of shoulder instability, and management of rotator cuff tears.

The 7 sections that take a regional approach to arthroscopy follow the basic format of pathology, clinical evaluation including appropriate diagnostic imaging studies, surgical indications, surgical techniques, surgical outcomes, and complications. One drawback is that this format is not always followed, which sometimes makes some information difficult to locate. However, the text is written in a relatively consistent manner despite having so many contributors. Presentation of the arthroscopic techniques is excellent and thorough, and the text is supplemented with extensive reference lists and an abundance of clear, large figures including color arthroscopic views, radiologic studies, and quality line drawings. Rehabilitation guidelines are general and limited in scope, and only include guidelines for arthroscopic procedures of the knee and shoulder. Other sources in addition to this text should be considered as reference texts for developing thorough rehabilitation programs following operative arthroscopy.

A CD-ROM also accompanies this text. Although no system requirements are given, the program was evaluated on a 1.1GHz PC with 128 MB RAM and Windows Millennium Edition. The opening screen has the following categories to choose from: 'Shoulder, Knee, Hip, Ankle, or Wrist.' Each of these categories are then subdivided into video clips of selected arthroscopic procedures. In all, 13 clips are included, with 9 of the video clips relating to either shoulder or knee arthroscopy. Selected topics include a 15-minute overview of arthroscopic repair for massive rotator cuff tears, a 12-minute video clip of meniscal repair, and a 35-minute overview of hip arthroscopy, including indications for surgery and arthroscopic procedures. The video clips are mostly comprised of arthroscopic views with the surgeon discussing the procedure, which allows for a greater level of understanding of the text. Because a different individual presents each video clip in his own manner, there is a lack of uniformity in presentation styles on the CD-ROM.

Overall, the third edition of *Operative Arthroscopy* is an outstanding and comprehensive text that will serve the orthopedic surgery community well. Because it is imperative that physical therapists have an understanding of the operative procedures that patients have undergone, this text is highly recommended as a reference for physical therapists working with patients following operative arthroscopy.

Michael D. Ross, PT, DHS, OCS

Pedowitz RA, O'Connor JJ, Akeson WH, eds. *Daniel's Knee Injuries: Ligament and Cartilage Structure, Function, Injury, and Repair*. 2nd ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2003: 636 pp., illus, with accompanying CD-ROM.

Daniel's Knee Injuries: Ligament and Cartilage Structure, Function, Injury, and Repair is an ambitious compilation of text and supporting illustrations and photographs addressing knee anatomy and function, injury evaluation and management, and special considerations, including pediatric issues. The primary purpose of this textbook, as indicated by the editors, is to provide current information to the student, clinician, and researcher, thereby assisting in the clinical decision-making process and encouraging additional knee injury-related research.

The book is comprised of 28 chapters from over 60 contributing authors. It is divided into 4 comprehensive sections, including structure, function, injury and repair, and special clinical issues. Section I discusses structural issues, including basic anatomy, ligament biochemistry and physiology, and developmental variations.This section contains a multitude of photographs of cadaver dissections clearly and concisely illustrating knee structures. Section II is comprised of discussions of ligament mechanics, articular cartilage characteristics, knee joint mechanoreceptor function, knee stability concepts, normal and abnormal healing mechanisms, meniscus injury concepts, and research topics. Section III presents the concepts of knee ligament injury epidemiology, physical examination and injury diagnosis, surgical principles, rehabilitation issues, and clinical outcome studies. Included in this section is a chapter devoted to imaging, with examples of normal anatomy as well as pathology derived from radiographs and magnetic resonance imaging. Finally, section IV discusses the issues of surgical decisions and treatment alternatives, ligament injuries in children and adolescents, and complications of knee ligament surgery.

As alluded to in the preface of the book, despite our best efforts we will

never entirely eliminate severe knee injuries from the general population. This textbook is consequently relevant and serves as a resource for the treating clinician. A great deal of the book is devoted to ligament and articular cartilage characteristics. Understanding the processes by which these structures heal is important when rehabilitating the injured individual and when researching ways to modulate and accelerate the healing response. The book additionally addresses diagnostic principles. It serves to adequately describe manual examination techniques, both in written and illustration formats. Unlike many similar works of the past, this textbook describes the importance of the posterior cruciate ligament and posterolateral corner of the knee and addresses related evaluation and clinical management. The rehabilitation clinician will further benefit from the book's discussion of surgery principles, including histological concepts, graft choices, surgical anatomic placement and fixation, and rationale for present vs. past techniques. A small portion is devoted to the area of rehabilitation. Finally, accompanying the text is a CD ROM developed by Oxford Joint Analysis Ltd. The CD transforms images from the text into 3-dimensional models. Examples include a simple 3-D mobility model, anatomic 3-D mobility model, and ACL mobility model. This CD is effective in depicting the complex biomechanics of the tibiofemoral joint. Moreover, it reinforces the concepts described in the text.

Daniel's Knee Injuries: Ligament and Cartilage Structure, Function, Injury, and Repair is recommended for the clinician in search of a broad-based overview of knee-related structure, function, dysfunction, and repair. The text is likely to be inadequate for the therapist in search of treatment-related ideas. Notwithstanding, secondary to the scope of information provided, this textbook would be a worthwhile addition to any orthopedic clinician's library.

David A. Schulz, PT, OCS, CSCS

Calliet R. *Low Back Disorders: A Medical Enigma.* Philadelphia, Pa: Lippincott, Williams, and Wilkins; 2003. 148 pp., illus.

Dr. Calliet has attempted to describe the possible sources of back pain as well as some appropriate treatments in his latest text. He describes back pain as a medical enigma as there are not specific anatomical or pathological causes, the examination findings are difficult to interpret and the treatments are numerous. In the 8 chapters included the reader will recognize the illustrations as they are similar in form as Dr. Calliet's other texts.

The first chapter is entitled The Current Concern with the Low Back. In this chapter, different pathological conditions are described such as facet pathology, spinal stenosis, and spinal instability among others. Clinical tests to determine muscle function and tests for an increase in intrathecal pressure are described and illustrated. Electromyography and discography are discussed briefly.

The anatomy and function of the vertebral column is the subject of the next chapter. Static and the kinetic properties of the spine are described. The contribution of the central nervous system is explored in the feed-forward mechanism that occurs with movement of the upper extremities. Axonal degeneration and retrograde degeneration are explored in detail in the radiculopathy section.

The intervertebral disc is the focus of the third chapter. Dr. Calliet stresses that disc disease is a term that is inaccurate as the disc is damaged, not diseased. This idea is important in patient management. The embryonic development of the disc and vertebrae, the anatomy and physiology of the disc, and the annulus and the proposed pathomechanics are explored. The use of imaging studies in the presence of an injury to the disc is explained. The fact that disc injuries and their causes and influence on symptoms are poorly understood is acknowledged.

The roles of the facet joints and the muscular system are found in the next 2 chapters. The anatomy and clinical presentation of facet dysfunction is presented as is the theory that the dorsal root and horn neurons can become the site of primary nociception and result in chronic pain. The role of the muscles in spinal stabilization, creating a spasm and being a source of symptoms is explored in the fifth chapter. The presence of fatigue is postulated as a contributing factor in acute low back pain.

Chapter 6 discusses other abnormalities that may lead to low back pain. Spondylolisthesis, spinal stenosis, piriformis syndrome, sacroiliac disorders, pelvic fractures, and sacralization of a transverse process are identified briefly. Surgical interventions are mentioned appropriately.

The last chapter delves into the treatment protocols. Here, acute and chronic low back pain is differentiated. The influences of psychological factors such as fear, expectations, etc. are mentioned, as is the importance of evaluating these emotional states, and their possible role in developing chronic pain states. The focus of the management for acute symptoms is patient education and reassurance. Recovering function, not the elimination of pain is stressed as the desired outcome. Different medications including using nonsteroidal anti-inflammatory drugs, analgesics, and epidural steroid injections are briefly discussed. The merits and pitfalls of various physical modalities, which include bed rest, heat, ice, manipulations, traction, and specific exercises, are given. Calliet states that failure to ensure spinal stability before using the spinal muscles for different tasks is a primary source of low back impairment and pain. He illustrates exercises that address these structures along with McKenzie extension exercises. The value of back schools, ergonomics, and proper lifting techniques are discussed. The psychological influences on the development of back pain and maintaining a chronic pain state are also dealt with. The author writes that both the mechanical and psychological components are pertinent in the evaluation and treatment of low back pain. Focusing exclusively on one or the other will not suffice to create a positive outcome.

This book is not a 'how to' text. This is a condensed, well-referenced book that attempts to address issues related to what we know about low back pain. One of the drawbacks in this book is that it is very short. There is sufficient literature and controversy on this subject that volumes have been written. The majority of the sections are condensed and an explanation of some of the statements are not included. The reader who has been exposed to the literature and the latest up-to-date evidence-based research would be able to appreciate this book more than an entry-level practioner. Calliet examines the issue of low back pain from a variety of mechanical and psychological viewpoints. This text would be appropriate for therapists and primary care physicians who treat patients with low back pain.

Jeff Yaver, PT

ORTHOPAEDIC SECTION, APTA, INC.
ANNUAL CONFERENCE BOARD OF DIRECTORS MEETING
WASHINGTON, D.C. • June 21, 2003

MINUTES

Michael Cibulka, President, called a regular meeting of the Board of Directors of the Orthopaedic Section, APTA, Inc. to order at 8:10 AM Eastern Time on Saturday, June 21, 2003.

Present:
Michael Cibulka, President
Lola Rosenbaum, Vice President
Joe Godges, Treasurer
Jay Irrgang, Director
Gary Smith, Director
Kelley Fitzgerald, Research Chair

Jim Dunleavy, APTA Board Liaison
Tara Fredrickson, Executive Associate
Terri DeFlorian, Executive Director (Secretary)

Absent:
Steve McDavitt, Practice Chair
Paul Howard, Education Chair
Rob Rowe, Practice Vice Chair

The agenda was approved as reordered.

The April 29, 2003 Board of Directors conference call meeting minutes were approved as printed.

The May 20, 2003 Board of Directors conference call meeting minutes were approved with one change to Motion 3.

The Board of Directors reviewed the CSM and Conference Call Board Meeting to be completed tasks.

The Board of Directors reviewed the Section's Goals and Objectives.

The Board of Directors, by consensus, agreed that the Performing Arts SIG can continue discussions with Actor's Equity under the condition that they don't take any action unless it is approved by the Section Board of Directors. The SIG must keep the Board informed of discussions that take place between the two groups.

The Board of Directors, by consensus, charged the Web Site Task Force (list members) to review and approve a list of items that will be emailed to Orthopaedic Section members each month.

=MOTION 1= Ms. Rosenbaum moved that Adam Smith be appointed as Membership Committee Chair. ADOPTED (unanimous)

=MOTION 2= Ms. Rosenbaum moved that the Practice Chair be the Orthopaedic Section liaison to the OMPT Manipulation Education Task Force. ADOPTED (unanimous)

=MOTION 3= Mr. Smith moved that the Orthopaedic Section approve Tim Flynn, Tony Delitto, Rob Wainner, and the Orthopaedic Section Practice Chair as its representatives to the Manipulation Education Task Force. In addition, the Orthopaedic Section approves funding for Trish King Baker for 1/2 of her expenses for the meeting to be held on June 21 and June 22, 2003. ADOPTED (unanimous)

=MOTION 4= Ms. Rosenbaum moved that the following policy be revised to include electronic media. The current policy states "Home Study Course authors will be granted the royalty-free right to reprint their original material in any books or articles of which they are authors or editors, provided an appropriate credit line to the Orthopaedic Section Home Study Course Series is included in the publication. This right does not extend to publication in electronic format." ADOPTED (Mike Cibulka, approved; Lola Rosenbaum, approved; Gary Smith, approved) (Joe Godges and Jay Irrgang reclused themselves from the vote due to a conflict of interest)

=MOTION 5= Mr. Smith moved that we respond to the publisher who requested permission to reprint figures from HSC 10.1 that we will allow the one-time use of this particular work but this right does not apply to future works. ADOPTED (unanimous)

=MOTION 6= Ms. Rosenbaum moved that the wording in the Copyright Release form and Photo/Table/Figure Release form be changed to read as follows: The publisher grants to the author the royalty-free right of republication of the author's original material in any written or electronic format of which he or she may author or edit. ADOPTED (unanimous)

=MOTION 7= Ms. Rosenbaum moved to approve the following home study course topics for 2005 and 2006:

2005 Pediatrics
Performing Arts
2006 Current Concepts in Orthopaedic Physical Therapy (update)
Strength and Conditioning

ADOPTED (unanimous)

=MOTION 8= Mr. Irrgang moved that the following pricing structure be put into place regarding online postings of CVs, position openings, and conference/course announcements (this information follows APTA's guidelines for advertising in *PT Bulletin* Online):

Description of Listings

Course Listings include announcements of professional development and continuing education courses, conferences, workshops, and seminars.

Job Listings include recruitment announcements and other positions that are available.

Positions Wanted includes items posted by individuals seeking employment or other similar situations.

Miscellaneous Listings include such items as used equipment or practices for lease/sale, fellowships/scholarships available, networking or volunteer opportunities available, and so on. Product advertisements are **not** accepted for posting.

Rates per 4-week listing

Basic listing: $25 for Orthopaedic Section members who provide a valid membership ID number that matches the billing information; $35 for APTA members who provide a valid membership ID number that matches the billing

information; $50 for non-APTA members (up to 500 characters, including spaces)
Additional characters: $75 (501-750 characters, including spaces)
Hyperlink: $75
Additional characters with link: $150

Advertising Policies
Advertisements are accepted when they conform to the ethical standards of the Orthopaedic Section, APTA, Inc. The Orthopaedic Section does not verify the accuracy of claims made in advertisements, and publication of an ad does not imply endorsement of the Orthopaedic Section or APTA. Acceptance of ads for professional development courses addressing advanced-level competencies in clinical specialty areas does not imply review or endorsement by the American Board of Physical Therapy Specialties.

The Orthopaedic Section prohibits preferential or adverse discrimination on the basis of race, creed, color, gender, age, national or ethnic origin, sexual orientation, disability, or health status in all areas including, but not limited to, its qualifications for membership, rights of members, policies, programs, activities, and employment practices. The Orthopaedic Section is committed to promoting cultural diversity throughout the profession. ADOPTED (unanimous)

=MOTION 9= Mr. Irrgang moved that the following policy be adopted:
Each Special Interest Group of the Orthopaedic Section, APTA, Inc. will be allowed to post information pertaining to outside company's courses/conferences on their applicable web site as approved by the web master after review by the Web Site Task Force. Each SIG will be allotted up to 25K of information on their designated page. Contact information for obtaining additional information may be shown, but links to outside company web sites will be charged a fee according to the pricing structure in our policy. ADOPTED (unanimous)

The Board of Directors, by consensus, appointed James Irrgang as the liaison to the Section's Historian.

The Board of Directors, by consensus, appointed James Irrgang as the liaison to the Bylaws Committee.

The Board of Directors, by consensus, recommended not raising Section dues.

Ms. Rosenbaum presented a summary of the JOSPT Strategic Planning Meeting that took place on June 20, 2003.

The Board of Directors agreed by consensus to schedule the next meeting as a conference call on Tuesday, August 5, 2003 at 3:00 PM CST.

The meeting adjourned at 1:10 PM.

Submitted by Terri A. DeFlorian, Executive Director (Secretary)

Education/Programming News

Another great CSM is being planned for February 4-8, 2004 in Nashville, Tennessee. The Orthopaedic Section is offering 3 pre-conference courses: "Medical Screening for PTs" (Primary Care Education Group), "Introduction to Dance Medicine" (Performing Arts SIG), and "Effective Management of Occupational Back Injuries from Initial Assessment to Return to Work" (Occupational Health SIG). Five other short programs are also being planned: "The Case for Unloading," "Cervical Spine Disorders: Current Best Evidence in Diagnosis and Intervention," "Public Relations and Marketing for PT," "Deactivation Pain and Therapeutic Exercise for Chronic Pain," and "Potential Author's Forum." These programs are all in addition to the excellent regular programming being developed by the Section's SIGs and Education Groups.

Also, we will once again have all handouts for the regular CSM programming available before CSM on the Section website. You will be able to download and print the handouts of presentations you plan on attending before you leave for CSM. Handouts will not be available on-site at CSM.

Finally we'd like to encourage Orthopaedic Study Groups to apply for CEUs for their programming through the Section. Contact the Section office for the details related to this new member benefit. If you do not have an orthopaedic study group near you, the time is right to organize one.

See you in Opryland,

Paul D. Howard, PT, PhD, OCS, Cert MDT
Education/Programming Committee Chair

Occupational Health Physical Therapists Special Interest Group

Orthopaedic Section, APTA, Inc.

Fall 2003 Volume 15, Number 3

ERGONOMICS GUIDELINES ANNOUNCED FOR NURSING HOME INDUSTRY

Brad Wolter, PT
Physical Therapy Chicago at Peoples Energy

On March 13th, 2003, the Occupational Safety and Health Administration (OSHA) released the final copy of *Ergonomics Guidelines for the Nursing Home Industry.* The first in a series of industry-specific guidelines for the prevention of musculoskeletal disorders (MSDs) in the workplace, the guidelines focus on practical recommendations for employers to reduce the number and severity of workplace injuries by using methods found to be successful in the nursing home environment.

"I'm pleased to announce that we have completed the guidelines that will help the nursing home industry prevent ergonomic injuries to their employees," said OSHA Administrator John Henshaw after the guidelines were released. "Nursing home workers are suffering too many ergonomics-related injuries, but the experiences of many nursing homes provide a basis for taking action now to better protect these workers. These guidelines reflect best practices for tackling ergonomics problems in this industry."

The guidelines are divided into 5 sections: developing a process for protecting workers; identifying problems and implementing solutions for resident lifting and repositioning; identifying problems and implementing solutions for activities other than resident lifting and repositioning; training; and additional sources of information.

The guidelines recommend minimizing manual resident lifting in all cases and the elimination of resident lifting when feasible. It is also recommends that employers develop a process for systematically addressing ergonomics issues in their facilities and incorporate this process into an overall safety and health program. The guidelines are available on OSHA's website at www.osha.gov.

In addition to nursing homes, OSHA is preparing industry-specific guidelines in the future for the retail grocery store and poultry processing industries.

CSM 2004- OHSIG Preconference Course- BE THERE!

State of the Art Information on:

"Effective Management of Occupational Back Injuries from Initial Assessment to Return to Work"

Speaker: Christina Boyle, PT
CBI Health, Canada

Topics to be covered include:

- Classifying nonspecific back pain into 5 syndromes
- Initial treatment based on one of these syndrome patterns
- CBI's 3 stages of recovery and progressing clients with effective, measurable goals
- How to recognize and manage pain-focused behaviors
- CBI Health research data will be discussed to support the clinical approach presented

For further background go to www.cbi.ca, click on "your health," click on "reading room" or "literature."

OHSIG MEMBERS ALERT-

Please update your email addresses.

We are trying to update our email addresses for OHSIG membership, so please make sure the Orthopaedic Section, APTA has your latest email address. You can contact them at 1-800-444-3982 or via Tara's email at tfred@orthopt.org. THANK YOU!

OHSIG Board

To see our officer listing please visit the Orthopaedic Section website at www.orthopt.org

FOOT & ANKLE

SPECIAL INTEREST GROUP

ORTHOPAEDIC SECTION, APTA, INC.

Greetings to All,

At the time of this message (June 2003) I have been through graduation ceremonies at many levels, from junior high, high school, college, and the graduate school commencement at USC. These graduations really show the change that happens so many times in our lives. Some changes can be difficult but necessary for all of us to move forward. With the summer months ahead, I am looking forward to my change in activities, more time outdoors, whether that be hiking on a vacation or listening to a summer concert at the local park on Friday nights.

PRESIDENT'S REPORT

The research retreat sponsored by the FASIG and the Orthopaedic Section will take place at the Department of Biokinesiology and Physical Therapy, University of Southern California. The dates of this meeting will be Friday April 30th and May 1st, 2004. Further information regarding the retreat can be found in the attached information from Irene McClay, the course coordinator. Irene has already established 2 prominent keynote speakers to highlight the program. Please see the attached information and feel free to contact either Irene or me.

As always, a major aspect of our SIG is the assistance to the education program at each CSM. This continues through the direction of Steve Paulseth, the Vice President.

VICE-PRESIDENT REPORT

Steve Paulseth is currently getting the programming reading for Nashville in 2004. For the 2004 meeting, the focus of the 4 hours of programming will be concerned with life span issues regarding the foot and ankle. As the year progresses, watch for the presentation listings. If you have education requests or ideas of speakers for the upcoming years, look for Steve's contact information in the officer's listing on page 52.

SECRETARY/TREASURER

Thanks to Mark Cornwall for overseeing the budget for the year 2004 of the FASIG. In addition, the Secretary/Treasurer will keep the minutes of the Business Meeting at the Combined Sections Meeting each year.

NOMINATING COMMITTEE

The Nominating Committee is made up of Tom McPoil, Bill Meredith, and the newest member is Cheryl Maurer. The Nominating Committee will be putting together a slate of candidates for the following offices:

President:	a 3-year term
Secretary/Treasurer:	a 3-year term
Nominating Committee member:	a 3-year term

In the June edition of *OP*, Steve Paulseth presented the pathomechanics and etiology of metatarsalgia, which was part of the FASIG preconference course at 2003 CSM meeting in Tampa, Florida. In this edition, a summary of a second presentation is written by Cheryl Maurer discussing the treatment of metatarsalgia. Cheryl's practice is made up of all foot and ankle, and she has a vast experience with foot orthoses.

As always, if there are questions, I can be reached through email at sfreischl@charter.net with questions or concerns.

Looking forward to the fall and the changes of events and seasons,

Steve Reischl

ORTHOTIC CONSIDERATIONS FOR FUNCTIONAL METATARSALGIA

Cheryl L. Maurer, PT, CPed

INTRODUCTION

By definition metatarsalgia means "pain in the metatarsal." Some patients may describe the symptoms of metatarsalgia as a sensation of numbness or burning under the ball of the foot, while others may describe it as the feeling of walking on pebbles. However simple it may appear, effectively treating metatarsalgia through orthotic therapy can be a challenge, frustrating both the patient and clinician, unless the clinician incorporates function-based clinical analysis.

ETIOLOGY OF METATARSALGIA

Metatarsalgia is associated with a variety of foot conditions, spanning all ages and activity levels (Table 1). As a result, the direct mechanical causes of metatarsalgia greatly vary, requiring specific orthotic intervention to be successful. For example, the orthotic technique used to treat metatarsal pain in a hypermobile foot is usually quite different from the technique used in a rigid foot. Successful orthotic intervention lies in accurately identifying the underlying causes of the dysfunction.

Table 1. Foot Problems Associated with Metatarsalgia

- Pes Cavus
- Pes Planovalgus
- HAV
- Metatarsophalangeal Abnormalities
  - Morton's Toe
  - Hammer Toes
  - Dropped Metatarsals
  - Forefoot hypermobility
  - Splayfoot

Most of the patients that present to physical therapy complaining of metatarsal pain have been sent by a referring physician or podiatrist. In some cases the patient may have been given a specific medical diagnosis of the condition, such as Freiberg's disease, while others may have a generalized diagnosis of metatarsalgia. Though both medical diagnoses are helpful, neither provides the clinician with the relevant information needed to begin the orthotic decision making process. Standard medical diagnoses of metatarsalgia, such as arthritis, inter-digital neuroma or stress fracture, describe the disorder at a tissue level (Table 2). Though this type of description yields some information regarding the impairments and dysfunction that a patient may be experiencing, it does not provide the essential information needed to identify the appropriate orthotic intervention and formulate a prognosis.

Table 2.

Articular	Non-Articular
• Capsulitis • Capsular Tear • Synovitis • Arthritis • Avascular Necrosis • Freiberg's Disease	• Flexor Tenosynovitis • Inter-digital Neuroma • Metatarsal Stress Fracture

'Pain in the metatarsal,' may be associated with articular or nonarticular impairments, (Table 2) or it may be the result of other physiological, musculoskeletal, environmental, or activity-related influences[1] (Table 3). As a result, a one-to-one relationship between the diagnosis of metatarsalgia and the treatment of "pain in the metatarsal" does not exist. Successful treatment requires careful consideration of all factors contributing to the biomechanical origin of metatarsal dysfunction.

Table 3. Other Factors of Metatarsalgia

Excessive Force	Improper Footwear & Fit	Physiology
• Pregnancy ◦ Increase weight ◦ Change COM ◦ Increase ligamentous laxity	• Poor Footwear Fit ◦ Short ◦ Narrow ◦ Poor heel to ball fit	• Local ischemia
• Obesity	• Poor Footwear ◦ Soles lack adequate protection	• Neuropathy
• Occupational Demands ◦ Freight Delivery		
• Activities ◦ Backpacking		

FUNCTIONAL METATARSALGIA

The clinical decision-making process used to guide the conservative care of metatarsalgia must be functionally based. Applying the basic principles of physics and movement science, a clear physical therapy diagnosis and prognosis for metatarsalgia can be formed, and appropriate intervention techniques employed. Using this framework, metatarsalgia can be classified into 2 groups, functional and nonfunctional (Table 4).

Functional metatarsalgia is defined as 'pain caused by abnormal mechanical stresses resulting from disordered function of the foot.'[2] Conversely, nonfunctional metatarsalgia is defined as the nonmechanical sources of metatarsal pain.[2] As simple as it may appear, this basic classification scheme quite powerfully directs the clinical management of patients suffering from impairments of the metatarsophalangeal joint.

Table 4. Classification of Functional Metatarsalgia

Functional	Nonfunctional
• *Pain caused by abnormal* mechanical stress resulting from disordered function of the foot	• Morton's Metatarsalgia/ Plantar Digital Neuritis

As defined above, functional metatarsalgia is the result of abnormal mechanical stress. Mechanical stress is defined as force-per-unit area (stress = force/area).[3] Consequently, functional metatarsalgia results from the abnormal forces associated with 'disordered function,' also known as 'dysfunction' of the foot (Figure 1). The mechanical stresses responsible for pain can be further categorized into 3 types of forces: compressive, shear, and tensile, each of which act within specific planes of motion[2] (Figure 1). As shown in Figure 1, structural, physiological, external and footwear influences may all play a role in creating or exacerbating the dysfunction and the resulting stresses associated with metatarsalgia. The role of orthotic intervention is to improve the functional mechanics of the foot. Improved foot function is accomplished by altering movement patterns to reduce abnormal foot/ground stresses, thereby enhancing weight-bearing efficiency. The mechanical influences of foot orthotics result in specific constraints on the planar influences that result in abnormal planar forces. In other words, sagittal plane impairments will likely result in sagittal plane compensatory behavior. One example of this is seen in the case of a pes cavus foot with metatarsalgia. The rigidity and more vertical angle of the metatarsals to the weight-bearing surface often result in excessive ground reaction force (GRF), along the metatarsal head (Figure 2). This can lead to deterioration of the plantar fibrofatty pads, causing pain. The cavus foot structure is a sagittal plane deformity that causes a sagittal plane compensation, yielding a sagittal plane dysfunction. One effective way to approach this case is to correct the abnormal sagittal plane influences using sagittal plane orthotic techniques. See Table 5 for a comprehensive assimilation of the most common foot conditions associated with metatarsalgia and their corresponding planar dominant forces.

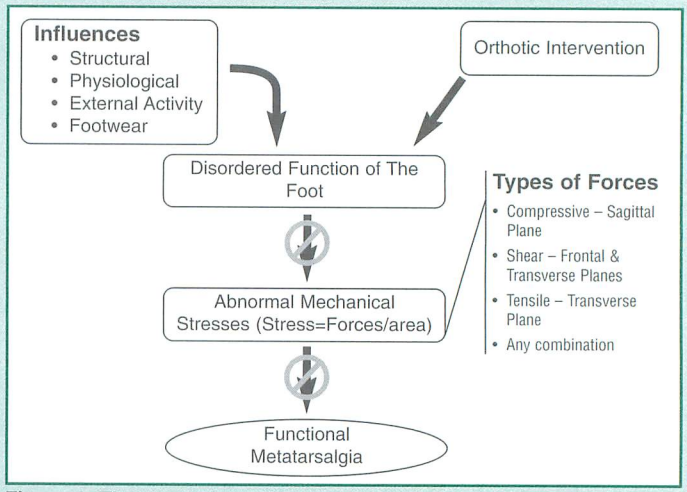

Figure 1. The dynamics of functional metatarsalgia & orthotic intervention.

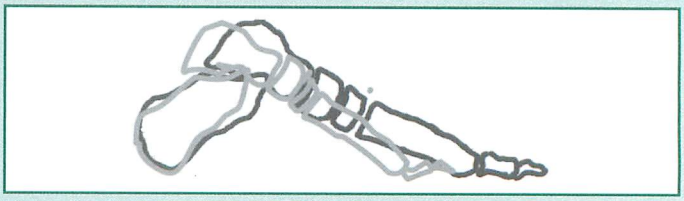

Figure 2. Pes cavus metatarsal angle.

The shear forces most commonly associated with functional metatarsalgia occur at the foot ground interface in both the frontal and transverse planes. These forces may be the result of the foot translating forward and backward in the shoe, or the abnormal translatory motion occuring under the forefoot during midstance and push off secondary to hypermobility.[4] The tensile stresses associated with metatarsalgia are primarily transverse plane stresses associated with severe splaying of the foot. The resulting loss of the transverse arch along the metatarsal heads causes stretching of the transverse ligaments and abnormal mechanics of the transverse pedis muscle.[5] Unlike

Table 5. Other Factors of Metatarsalgia

Compressive Forces (Sagittal Plane)	Shear Forces (Frontal & Transverse Planes)	Abnormal Tensile Stresses (Transverse Plane)
• **Rigidity** ◦ Pes Cavus* ◦ Ankle Equinus ◦ Forefoot Equinus • **Fixation** ◦ Plantar flexed Ray • **Fixation Retraction** ◦ Clawing Toes • **Subluxation or dislocation of any metatarsal** • **HAV** resulting in compensation of the lesser metatarsus ◦ 2nd toe hammered with subluxation or dislocation of MTP	• **Hypermobility of 1st & 5th Rays** ◦ Results in a loss of the transverse arch with equal weight bearing along the lesser metatarsus ◦ Results in a long 2nd to 1st met ratio resulting in greater force under the 2nd met thru push off • **Generalized Hypermobility** ◦ Forefoot hypermobility with midfoot and rearfoot instability • **Forward translation of the foot in improperly fitting footwear**	• **"Splayfoot"** ◦ Hypermobility of all osseous structures ◦ Subluxation of rays at bases ◦ Excessive STJ pronation ◦ Excessive spreading of 1st met from 2nd & 5th from 4th. ◦ Pain associated with tensile strain on the transverse pedis and metatarsal ligament **(See Figure 3)**

Figure 3. "Splayfoot" transverse arch.

both the sagittal plane compressive force and frontal and transverse plane shear forces that act at the foot-surface interface, the transverse plane tensile stresses occur dorsal to the foot-surface interface, acting in the plane of the metatarsal heads.

Evaluating and Treating Functional Metatarsalgia Through Orthotic Therapy

A thorough evaluation of the patient as well as the foot/shoe or foot/orthotic interface is necessary for the clinician to correctly identify the primary type of dysfunctional force acting on the metatarsals. Once the type of force is appreciated, the clinician can correlate the planar dominance of the forces to the primary plane of orthotic correction. First attempts should be made to correct or accommodate for foot dysfunction in the plane of pathology.

Revisiting the sagittal plane pes cavus example described above, one orthotic technique used to reduce the vertical GRF acting on the metatarsal heads involves unweighting the metatarsals by leaving the anterior edge of the orthotic shell full thickness. It is standard practice to taper the anterior edge of the orthotic shell posterior to the metatarsals, allowing for an even surface transition between the orthotic and shoe. Maintaining full thickness of the anterior edge of the orthotic shell creates a vertical elevation posterior to the metatarsals, thus reducing the GRF acting on the metatarsals and alleviating symptoms. Treating dysfunction that is manifested in a plane other than the sagittal plane may not be successful using this type of orthotic technique.

Metatarsalgia associated with 'splayfoot' dysfunction, a condition primarily occurring in the transverse plane, is most effectively controlled using transverse plane orthotic techniques, such as a deep heel cup, medial flange, and lateral flange. The use of these transverse plane techniques will help constrain the excessive motion that occurs in the subtalar and midtarsal joints, consequently reducing the splaying of the forefoot in the transverse plane. In addition, a metatarsal pad may be added to the orthotic to restore some of the foot's frontal plane arch, known as the transverse arch.[7] By increasing the frontal plane contour of the arch, the collapse of the metatarsals into the transverse plane will be reduced and strain along the transverse ligaments and transverse pedis muscle will be reduced. (See Table 6 for a comprehensive assim-

Table 6.

Condition	Negative	Positive Cast	Orthotic Type	Special Orthotic Considerations	Top Covers, padding, etc.
Compression Sagittal Plane Dysfunction					
Pes Cavus	**Accomodative** • Foam box • Slipper cast Captures partially compensated foot	• Blow out areas of high pressure	**Type 1.** • Total Contact • Polymer, Co-polymer	• Leave anterior edge of orthotic shell full thickness (See Figure 4) • Negative heel	**Cushion and accommodation** • Bi or tri-laminate
			Type 2. • Total Contact • EVA ◦ Multi- density	• Intrinsic metatarsal pad contours and toe crest pads	
Rigid Plantar Flexed 1st Ray	**Prone Neutral Slipper Cast** • Loading thru 4th & 5th Mets. (See Figure 5) Captures the foot with lower medial and lateral arches.	• Balance to vertical	• Total Contact • Polymer or co-polymer	• 1st ray cut out • Bar post 2 – 5 to Mets. or sulcus • Dancer's Met. pad or balance pad for the 1st Met.	**Durable cushioning** • Neoprene with poron extension to toes
Fixed Retraction • Clawing Toes	**Accomodative**	• Blow out areas of high pressure	• Total Contact • EVA ◦ Multi-density	• Negative heel • Soft Metatarsal pad • Metatarsal bar • Toe Crest Pads	**Cushion & Accommodation** • Bi & Tri-laminate
Subluxation or dislocation of any metatarsal	**Accomodative**	• Blow out areas of high pressure	• Total Contact • EVA • Multi-density	• **(as above)** • Footwear ◦ Forefoot rocker-sole	• **(as above)**
HAV: resulting in compensation of the lesser metatarsus • **2nd Toe Hammered with subluxation or dislocation of MTP**	**Supine suspension Cast** • Loading thru 4th & 5th digits (See Figure 6) Captures the best nonweight-bearing sagittal plane contours of the foot. Best for balancing out forefoot supinatus and a doris-flexed 1st ray.	• Standard	• Polymer or Co-polymer	• Hallux activation pad to facilitate 1st MTP DF (See Figure 7) • Balance pad under 2nd Met. (See Figure 7) • Toe crest pad • Metatarsal Bar	• **(as above)**
Morton's Toe Long 2nd Metatarsal	**Prone Neutral Slipper Cast** (See Figure 5) Capturing the foot with lower medial and lateral arches lengthens the medial column reducing the plantar-flexed position of the 1st Ray.	• Standard	• Polymer or Co-polymer	• Full shell width under 1st ray • Morton's Extension • Balance pad for the 2nd Met. • Soft Met. Pad extending 10 – 15 mm distal to the anterior shell	**Durable Cushioning** • (as above)

(Table 6 continued on page 52)

Table 6. Continued

Condition	Negative	Positive Cast	Orthotic Type	Special Orthotic Considerations	Top Covers, padding, etc.
Shear & Compressive Forces Sagittal & Frontal Plane Dysfunction					
Hypermobility of 1st & 5th Rays • Loss of transverse arch resulting in equal weight bearing along all metatarsal heads. • Anterior translation of metatarsals creating a relative lengthening of the 2nd Met.	**Supine suspension via Flexor Digitorum Longus**	• Standard • Medial heel skive • Widen medially Widening the device medially increases the supinatory moment arm	• Polymer or Co-polymer • Polymer or Co-polymer	**Control rearfoot pronation:** • Varus posting • Deep heel cup **Control midfoot transverse and frontal plane motion:** • Medial flange • Lateral flange **Control forefoot sagittal and frontal planes:** • 1st Ray Cut Out • 5th Ray Cut Out • Keep full thickness of anterior shell • Metatarsal Pad	**Low friction breathable** • Bi-laminate • Toe crest pads
Tensile Strain Transverse Plane Dysfunction **"Splayfoot:"** hypermobility of all osseous structures, subluxation of rays at bases, excessive STJ pronation, insufficiency of transverse Pedis, excessive spreading of 1st met from 2nd & 5th Met from 4th, pain associated with tensile strain on the transverse Pedis and metatarsal ligament	**Supine Suspension via Flexor Digitorum Longus**	• Balance Inverted		• (as above)	**Durable Cushioning** • Neolon with poron extension to toes

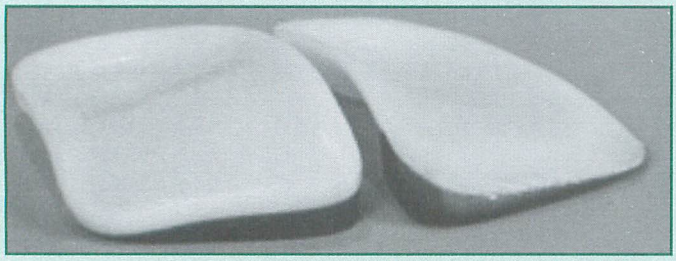

Figure 4. Distal shell thick-

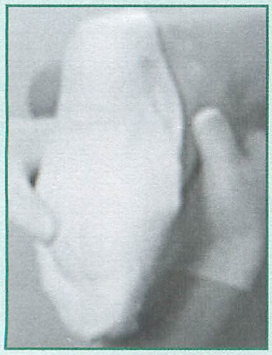

Figure 5. Prone casting.

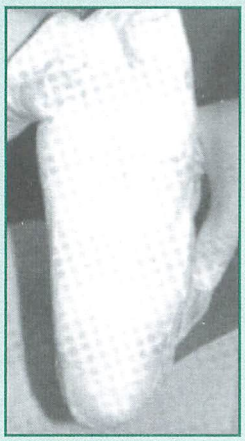

Figure 6. Suspension cast.

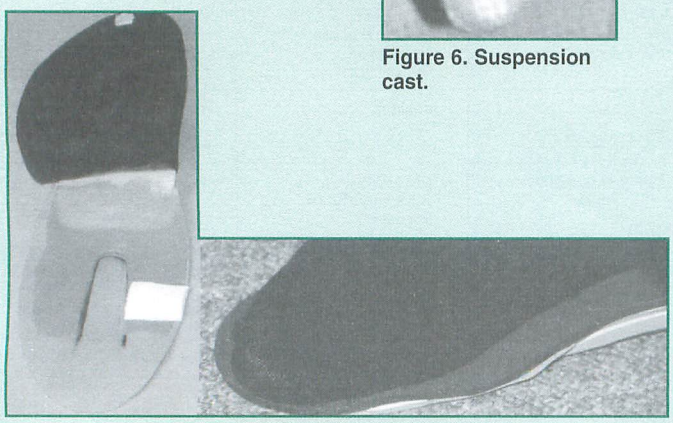

Figure 7. Hallux activation pad.

ilation of orthotic techniques that can be incorporated in the treatment of functional metatarsalgia.)

CONCLUSION

Metatarsalgia is a complex and multifactorial manifestation of foot dysfunction. Successful treatment may be best achieved through functional-based clinical decision making. Addressing the planar dominance of metatarsal dysfunction directly using planar specific orthotic techniques may help to alleviate patient symptoms and restore functional mechanics of the foot in an efficient and successful manner.

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Performing Arts Special Interest Group • Orthopaedic Section, APTA

Message from the President

Hello everyone! We are moving quickly through this year and hopefully some of you were able to attend Annual Conference in Washington, DC. Our next major meeting is CSM 2004 in Nashville, Tennessee from February 4-8. We will be offering our 'Introduction to Dance Medicine' course and preparations are well under way. Perhaps there is time for you to get away, mingle with fellow performing arts colleagues, and gain CEUs along the way. Course information should be posted on our website (www.orthopt.org) in the near future, although sign-ups for this course will not occur until later in the year.

Contacts that have been made with Actor's Equity are still in the formative stages as we are still defining how it is that we can best offer assistance. Marshall Hagins, Shaw Bronner, and I met in New York with several of Actor's Equity representatives to help answer a few of these questions. I would very much appreciate if those of you who still wish to be involved on a PASIG task force regarding Actor's Equity would e-mail or call me to confirm your desire to remain on the task force (305-595-9425 or jsptocs@hotmail.com). As yet, there have been no new "to-do" items for the task force, so there hasn't been any new information to share until now. Thanks for your patience as we determine the scope of any PASIG involvement.

Lynn Medoff is fast at work ensuring that our general programming will be as exciting as the preconference course promises to be. Drop her a line or e-mail if you think you can offer help in handling details related to this important part of our CSM programming (lemedoff@hotmail.com). We will also need several volunteers for the preconference course, so please e-mail me if you are interested. Susan Clinton, our Secretary, is busy trying to solicit correct membership address/contact information to assure an accurate membership directory. Note that we have included a membership form at the end of this newsletter for you to complete. You may call or e-mail your contact information to the Orthopaedic Section at 1-800-444-3982 or tfred@apta.org.

Adrienne, our Treasurer, has been hard at work on suggested budget changes from our last membership meeting in Tampa, Florida. She has also been working with the Orthopaedic Section on redoing our website (www.orthopt.org) although several of our links are still under construction. Please be patient as more information becomes available. We should have outlines of our preconference course, general programming, and upcoming platform presentations at CSM 2004 pertaining to the performing arts. I have requested that the Orthopaedic Program Chair try to group special interest topics together when scheduling these presentations. Hopefully this will make it easier for more of you to attend and support these individuals. You will also notice that our general programming will be held on Thursday, February 5th (with our Business Meeting immediately following) so that we do not overlap with Foot/Ankle programming as many of you have requested.

We will be arranging a reception at CSM 2004 to thank our speakers and so that each of you has a chance to better network with your fellow members. Look for details in upcoming *OPTP* newsletters. Elections will be held for a new Vice President and Secretary (read more details below). Shaw Bronner, our Nominations Chair, has garnered a few names of those individuals who would like to serve on your executive board and is always interested in hearing from members who would also like to get involved (Shaw's e-mail: sbronner@liu.edu).

Remember, I need to hear from members who still want to participate in the task force responding to Actor's Equity's request. I can be more specific when I hear from each of you. Your board is hard at work for you. We welcome your feedback, concerns, and ideas. Please do not hesitate to contact any one of your board members. Until next time, keep the arts alive!

Jeffrey T. Stenback, PT, OCS
President, Performing Arts Special Interest Group

ANNOUNCEMENTS:

Combined Sections Meeting in Nashville, TN
PASIG Preconference Course

PERFORMING ARTS SPECIAL INTEREST GROUP
INTRODUCTION TO DANCE MEDICINE

INSTRUCTORS: Brent Anderson PT, OCS
Shaw Bronner PT, MHS, EdM, OCS
Jennifer Gamboa MPT, OCS
Marshall Hagins PT, PhD

I. Introduction to Dance:
Lecture/Interactive Demonstration

II. Preseason Screening for Dancers:
Lecture/Demonstration

III. Dance-specific Functional Examination and Evaluation:
Lecture/Demonstration

IV. Treatment Essentials for Dancers:
Lecture/Lab

V. Getting Started in Dance Medicine:
Panel Presentation/Discussion

Look for a more detailed course outline on our website at www.orthopt.org

NOMINATING COMMITTEE:

Last Call for Nominations

The PASIG invites you to submit your name or that of a willing candidate to run for office. Help to contribute and learn about the performing arts by serving. The following positions are open for nomination: Vice President and Secretary. Each position is for a 3-year term. This is a great way to get involved and meet wonderful people from across the country. As *OP* goes to press, Tara Jo Manal and Karen Hamill have agreed to run for Vice President and Julie O'Connell for Secretary. We hope others of you will step forward to run as well. Please don't hesitate to nominate yourself!

Guidelines: Nominees must be PASIG and Orthopaedic Section members. Nominees must give their consent to be nominated before their names are put forward. Nominees may be self-nominated. Upon agreeing to be nominated, nominees will be asked to write a short biography and a position statement (250 words) regarding their ideas and role as an officer in the PASIG.

PASIG Vice President Job Description

1) Assumes all duties of the President if she/he is unable to serve and/or attend scheduled meetings.
2) Serves as a voting member of the Executive Board
3) Coordinates PASIG programming (for CSM) with the Program Chair of the Orthopaedic Section based on suggestions by the PASIG membership.
4) Is liaison for all PASIG program speakers to the Orthopaedic Section and is responsible for meeting all speaker information deadlines for CSM.
5) Coordinates the annual PASIG membership survey at CSM.
6) Attends all PASIG Executive Board Meetings, conference calls, and the Annual Business Meeting at CSM.
7) Other duties as assigned by the President.

PASIG Secretary Job Description

1) Serves as a voting member of the Executive Board.
2) Serves as Editor for the newsletter and chair of the Membership Committee.
3) Is responsible for recording, or providing for recording of the PASIG Annual Business Meeting and all Executive Board minutes. Minutes are typed and distributed to the PASIG Executive Committee and Orthopaedic Section Executive Committee.
4) Maintains all written records of PASIG with copies sent to the Orthopaedic Section office.
5) Maintains PASIG membership records with copies sent to the Orthopaedic Section office.
6) Submits, in coordination with the Executive Board, information relative to PASIG functions to the Managing Editor of Journals/Newsletters for publication in the *Orthopaedic Physical Therapy Practice*.
7) Serves as liaison to the Editors of Orthopaedic Section and APTA publications (eg, *OPTP*)
8) Other duties as assigned by the President.

Candidate statements will be available prior to voting.

Please contact: Shaw Bronner PT, MHS, EdM, OCS
Nominating Committee Chair
Work: 718-246-6377
Fax: 718-246-6383
Email: sbronner@liu.edu.

EDUCATION COMMITTEE:

Programming for CSM 2004

The committee is proud to present another innovative and informative collection of courses designed to improve the skills of the therapist involved with performing artists.

Preconference Course

The PASIG is offering a 1-day preconference course on dance medicine taught by physical therapists Brent Anderson, Shaw Bronner, Jennifer Gamboa, and Marshall Hagins. It is a comprehensive introductory course designed for therapists interested in learning how to treat dancers as well as those experienced in performing arts medicine who would like to perfect their skills. It includes introduction to movement vocabulary, epidemiology of dance injuries, preseason screening, and labs addressing analysis of movement mechanics and treatment of specific dance injuring.

Conference Programming

Music

This year the PASIG is teaming up with the Hand Section to sponsor Lori Stotko, OTR, CHT who will present on the use of taping, splinting, and ergonomic modification of instruments in the treatment of overuse injuries in musicians.

Shop Talk
Lynn Medoff, MA, MPT and Nicholas Quarrier, MHS, PT, OCS will present an interactive session with musicians to demonstrate their treatment techniques in improving posture, movement mechanics, and preventing and treating injury.
Research
Dance
Shaw Bronner, PT, MHS, EdM, OCS, who works with the Alvin Ailey modern dance company, will present her research on the effect of comprehensive management on injury incidence and time loss.

Advanced Clinical Practice
Jennifer Gamboa, MPT, OCS, Marshall Hagins, PT, PhD, and Tara Jo Manal, PT, OCS will present the outcomes of a 2-year project to create a description of advanced clinical practice in the performing arts.

The PASIG is also planning a reception at CSM so all members and other therapists can come and meet the speakers and indulge in some great conversation together in a more relaxed atmosphere. Please watch the web site and the Newsletter for more information!

WE HOPE TO SEE YOU IN NASHVILLE!

Lynn Medoff, MPT, MA
Vice Chair of the Education Committee

PUBLIC RELATIONS/MEDIA COMMITTEE:
Budget changes are still in the works and the committee is working with the Orthopaedic Section to determine what will be available after nomination mail outs etc. There is still a consensus to advertise the preconference course and programming in other magazines to help increase the visibility of the PASIG.
Please visit our new (and still improving) website at www.orthopt.org and click on "SIGS." If you would like to be listed under "Find a PT", please send your name and contact information to tfred@orthopt.org with PASIG typed in the subject line. Please note that the Dane/Music Glossary is now listed on the website.

Adrienne McAuley, PT, OCS
Treasurer

MEMBERSHIP COMMITTEE:
Every member should have received an email requesting updates on contact information as well as any affiliations with performing arts academies and student clinical sites. Please be sure that each of you completes the updates and returns this email as soon as possible so we can meet our goal of a new updated Membership Directory in 2004. Be sure to tell us if your information can be included in our new website for membership contact.

If you did not get an email, please contact me as soon as possible so your information can be updated and included in the new directory (sclint@lsuhsc.edu). *Thank you*
Please contact: Susan C. Clinton, PT, MHS, Membership Chair
Work: 504-568-3454
Fax: 504-568-4538
Email: sclint@lsuhsc.edu

GET INVOLVED IN THE PASIG AND THE FUTURE IS YOURS !

Join your fellow PASIG members in becoming an ambassador for the Performing Arts! The PASIG wants to encourage all our members to become actively involved by serving as committee members, regional directors, officers, and by offering your input at business meetings and through communication with other PASIG members. Remember, when you give of your time and energy to the PASIG, it's like giving a gift to yourself! The PASIG is only as strong as its members. If you have an interest in committee involvement, please contact the Committee Chairperson, who is listed in the Directory on the last page of this newsletter.

PASIG Resources

PERFORMING ARTS SPECIAL INTEREST GROUP • APTA

Let PASIG help you MARKET your services!

PASIG BROCHURES AND LOGO PINS are available to help you advertise and build your performing arts patient base. You can use the **BROCHURES** to market yourself to the performing arts community, the medical community, and to colleagues in the physical therapy community. You may proudly wear the **PASIG Logo Pin** to increase professional exposure.

The **PASIG MEMBERSHIP DIRECTORY** is an excellent resource for referrals, especially when your patients travel out of state. It includes state-by-state and alphabetical listing of PASIG members, as well as a Student Affiliation Site List. And don't forget, we still have **DANCE / MUSIC GLOSSARIES** available to assist you and your colleagues in communication with your performing artist patients. **ORDER NOW!**

PASIG PINS	$5.00
PASIG DIRECTORIES	$3.00
PASIG BROCHURES	$15.00 (package of 25)
GLOSSARIES	$2.00

TO ORDER: Call the Orthopaedic Section at 1-800-444-3982.

Performing Arts Special Interest Group
MEMBERSHIP FORM:

PERFORMING ARTS SPECIAL INTEREST GROUP • APTA

To be a PASIG member, you must also be a member of the Orthopaedic Section. You may use this form for **new membership, change of address, or updating your information.**

Name:_____ Prof. degrees/certifications: _____

Company Name: _____

Address_____

City_____ State____ Zip_____ Phone_____ Email _____

APTA member number:_____ Orthopaedic Section Member: yes no

Years of experience treating performing artists:_____

What percent of your patient population are performing arts patients?

____Dancers _____Gymnasts _____Skaters

____Musicians _____Singers _____Circus Performers

Please list if you are affiliated with any performing arts schools, companies, or groups below:

_____

_____

_____

Do you accept Student Affiliations?
_____Yes _____No

Are you interested in serving as a mentor to other physical therapists or physical therapy students interested in the treatment of performing artists? _____ Yes _____ No

Are you interested in serving on any of the PASIG Committees?

_____Practice _____Public/Media Relations
_____Education _____Website
_____Nominations _____Membership/Regional Director
_____Research

Can we list your name and contact information on the PASIG website, www.orhtopt.org for membership contact:
_____Yes _____ No

Thank you for taking the time to complete this questionnaire. We look forward to having you as a member. Please return this form to the Orthopaedic Section or email the information to tfred@orthopt.org.

PASIG EXECUTIVE COMMITTEE

President: Jeff Stenback, PT, OCS
Orthopedic Rehabilitation Specialists
8720 North Kendall Dr, Ste 206
Miami, FL 33176
Ph: 305.595.9425 / FAX: 305.595.8492
Email: jsptocs@hotmail.com

Vice President: Lynn E. Medoff, MPT, MA
1428 Mariposa Rd.
Flagstaff, AZ 86001
Ph: 520.527.8601 / FAX: 928.527.8601
Email: lemedoff@hotmail.com

Treasurer: Jennifer (Adrienne) McAuley, PT, OCS
7830 Old Georgetown Rd., Ste C-15
Bethesda, MD 20814-2432
Ph: 301.656.0220 / FAX: 301.654.0333
Email: mcauley@painpoints.com

Secretary: Susan C. Clinton, PT, MHS
Department of Physical Therapy
LSU – Health Sciences Center
1900 Gravier Street, 7th Fl.
New Orleans, LA 70112-2262
Ph: 504.568.3434 / FAX: 504.568.5438
Email: sclint@lsuhsc.edu

COMMITTEE

Education Committee Chair:
Lynn Medoff, MPT, MA (contact information at left)

Practice Committee Chair:
Marshall Hagins, PT, PhD
Division of Physical Therapy
Long Island University
Brooklyn, NY 11201
Ph (W): 718.488.1489 / FAX: 718.780.4524
Ph (H): 718.398.1897
E-mail: mhagins@titan.liu.edu
Members: Joel Dixon, PT; Brent Anderson, PT; Lisa Shoaf, PhD, PT

Nominating Committee Chair:
Shaw Bronner, PT, MHS, OCS
ADAM Soar Research at Long Island University
122 Ashland Pl. #1A
Brooklyn, NY 11201
Ph (W): 718.246.6377
FAX: 718.246.6383
E-mail: sbronner@liu.edu
Members: Julie O'Connell, PT; Gayanne Grossman, PT

Public/Media Relations Committee Chair:
Jennifer (Adrienne) McAuley, PT, OCS
(contact information at left)
Members: Janet Konecne, PT

Regional Directors
(Subcommittee of Membership Committee) Chair
Susan C. Clinton, PT, MHS (contact information at left)

- **Northeast** (CT, MA, ME, NH, NY, RI, VT)
  Marshall Hagins, Marijeanne Liederbach
- **Mid-Atlantic** (DE, DC, MD, NC, NJ, PA, VA, WV)
  Tara Jo Manal, Laura Schmitt
- **South** (AL, FL, GA, KY, LA, MS, SC, TN)
  Edie Shinde, Jeff Stenback
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- **Northwest** (ID, MT, NB, ND, OR, SD, WA, WY)
  Jill Olson
- **West** (AK, AZ, CA, CO, HI, NV, NM, UT, TX)
  Cheryl Ambroza

Membership Committee Chair:
Susan C. Clinton, PT, MHS
(contact information at left)
Members: Alice Burton, PT; Terry Sneed, PT

Research Committee Chair:
Lisa Sattler, PT
1140 First Ave. Apt. 6
New York, NY 10021-7961
Ph: 212.838.6847
Members: Scott Stackhouse, PT; Brent Anderson, PT

Pain
MANAGEMENT
SPECIAL INTEREST GROUP • ORTHOPAEDIC SECTION, APTA, INC.

Letter from the President

Joe Kleinkort, PT, MA, PhD, CIE

The field of phototherapy, once called laser, is blooming right before our very eyes. There have been multiple studies at NASA that even show that retinal damage can be reversed by photonic stimulation. Now we are seeing a wide variety of photostimulation devices coming onto the therapeutic scene in the US. Each has a certain amount of efficacy and each has a somewhat different claim and approval from the FDA. It is important that we all take a very hard look at these devices. All have had to show the FDA that they are effective on a much easier scenario than before. Nevertheless these studies show the efficacy of each individual unit and the use they may be in the therapeutic melieu. It is important that we determine those modalities that best serve our needs and the needs of our patients.

The researchers have shown us in over 2000 papers the efficacy of these devices and the vast number of parameters that they operate in physiologically. These types of systems can significantly shorten and enhance the therapeutic effect that we seek in patient care. It behooves us as therapists to look at these new modalities as they come on the market to see their potential in patient care. The modalities that will be advanced in the next 10 years will dwarf those that we presently use. We must not stagnate and always grow in the arena of care especially in the field of pain management.

As the summer approaches, we again get ready for the Combined Sections Meeting in Nashville this coming year. Our programming this year will encompass both Phototherapy and Functional Manual Therapy. I hope to see each of you there and as always welcome any articles that are of interest to you in the realm of pain management. May each of you have a wonderful and blessed summer.

The Emerging Paradigm of LLLT

Joe Kleinkort, PT, MA, PhD, CIE

If a writer is so cautious that he never writes anything that can be criticized, he will never write anything that can be read. If you want to help other people you have got to make up your mind to write things that some men will condemn.

Thomas Merton "Seeds of Contemplation"

Occam's razor states, "What can be done with fewer is done in vain with more." This appears to be glaringly true in the complex physiology of the human body. Although we have successfully used light sources since the BC periods of history, only recently with the advent of laser in the early 60s and its subsequent use in the 80s in physical therapy, have we begun to touch the meaning and importance of the essence of the "vix mediatrix naturae" of light to life itself!

Low Level Laser Therapy (LLLT) has actively been an essential part of a therapeutic regimen for practitioners around the world since the early 80s. It has not actually caught on in the US until very recently and the vast majority of students have not even been taught its efficacy and use.

There are many biological components that take place in the tissue that have been successfully demonstrated with the use of LLLT therapeutically. One of these is the significant enhancement of ATP. We now know that Ling has shown the fundamental necessity of ATP as the cardinal absorbent of the resting living state of the cell and without it the cell cannot maintain life![1] Since Lohmann's discovery of ATP in 1929, we now know that ATP is the product of all energy metabolism, aerobic as well as anaerobic. Further, we know that in muscles all ATP is absorbed in myosin.[1] This is one key that helps us to understand how specific lasers are able to significantly reset muscle clinically in a very short period of time. However some other emerging science is necessary to understand greater scope of this most dramatic and helpful modality of the new century.

In the 60s at the same time Maiman was discovering laser, Herbert Frohlich predicted on the basis of quantum physics that the living matrix of the body must produce laser-like coherent oscillations. These vibrations within the living matrix of the body occur at various frequencies and are exceedingly sensitive to the information conveyed by coherent signals.

"Coherent vibrations recognize no boundaries, at the surface of the molecule, cell, or organism- they are the collective or cooperative properties of the entire being. As such, they are likely to serve as signals that integrate processes, such as growth, injury repair, defense and functioning of the organism as a whole."[2] Each molecule, cell, tissue and organ has an ideal resonant frequency that coordinates its activities. By manipulating and balancing the vibratory circuits, complementary therapists are able to directly influence the body's systemic defense and repair mechanisms.

This crystalline living matrix act as coherent molecular antennae both receiving and transmitting data and can change their resonant frequencies and also store data.[2]

This helps us to understand the complex mechanism of laser being able to reset musculature returning its function to normal in a very short period of time. This phenomenon creates a new paradigm for the use of laser in the patient with chronic pain and can have a profound, efficient and immediate affect on the recipient of the treatment. The effect of significant increase of ATP at the myosin can have a profound effect on the modulation of muscle. Another theory that we must consider is the very essence of lambda nu (energy emitted from the laser) can reset the muscle as well. It is clinically obvious that these effects occur and the complete explanation remains forthcoming.

Not only does laser increase ATP at the cellular level, but researchers have shown that it causes stimulation of the mitochondria, cellular enzymes, macrophage activation, collagen synthesis, significant increase of granulation tissue, increased permeability of cell membranes, increased serotonin and endorphin with decreased c fiber activity and bradykinin.[3] These are but a few mechanisms that have been proven to take place with laser irradiation. I know of no other modality that even comes close to the myriad of physiological changes that take place with the laser and yet no adverse effects. All therapist must do all that they can to understand and accept this tremendous new modality that will cause a tremendous change in the way we address our patients in pain. After over 20 years of experience with laser and thousands of thankful patients, it is time that we pay particular attention to this new paradigm in treatment before others steal it from our armamentarium. Let us "See the Light."

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1. Ling G. *Life at the Cell and Below – Cell Level.* New York, NY: Pacific Press; 2001:234-246.
2. Oschman J. *Energy Medicine.* London, England: Churchhill Livingstone; 2000:130.
3. Tuner J, Hode L. *Laser Therapy.* Grangesberg, Sweden: Prima Books; 2002:362.

PAIN MANAGEMENT SPECIAL INTEREST GROUP BOARD LISTING

Animal Physical Therapist

SPECIAL INTEREST GROUP

Orthopaedic Section, APTA, Inc.

ANIMAL PHYSICAL THERAPIST SPECIAL INTEREST GROUP
DIRECTORY OF OFFICERS & CHAIRPERSONS

President
Deborah Gross Saunders, MSPT, OCS
PO Box 31
East Lyme, CT 06333
Phone: 860-227-7863
Fax: 860-537-8703
E-mail: wizofpaws@aol.com

Vice President and International Liaison
David Levine, PT, PhD, OCS
Department of Physical Therapy
University of Tennessee at Chattanooga
615 McCallie Avenue
Chattanooga, TN 37403
Work: 423-425-5240
Fax: 423-425-2215
E-mail: david-levine@utc.edu

Treasurer
Sandy Brown, MSPT
1624 Prestwick Dr.
Lawrence, KS 66047
Phone and Fax: 785-749-9254
Email: sandyb@sunflower.com

Secretary and Public Relations Coordinator
(Newsletter, Logo, Brochure)
Becky Newton, MSPT
1931 Pine Avenue
Alva, FL 33920
941-694-8851
jbeckyn@yahoo.com

Committee on Practice
Caroline Adamson, PT, MS
Colorado Canine Sports Medicine/ Rehabilitation Clinic
Alameda East Veterinary Hospital
9870 E. Alameda Avenue
Denver, CO 80231
Work: 303-366-2639
FAX: 303-344-8150
E-mail: carolineadamson@juno.com

Chair of Education
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Newsletter Coordinator
Becky Newton, MSPT
1931 Pine Avenue
Alva, FL 33920
941-694-8851
jbeckyn@yahoo.com

State Liaison Coordinator
Siri Hamilton, PT, LVT
University of Tennessee College of Veterinary Medicine
Dept. of Small Animal Clinical Services
2407 River Drive
Knoxville, TN 37901-1071
Home: 865-573-7356
Work: 865-974-2993
E-mail: sirivtpt@utk.edu

Nominations Committee
Amie Lamoreaux–Hesbach, MSPT
Mid-Atlantic Animal Specialty Hospital
4135 Old Town Road Suite B
PO Box 1168
Huntingtown MD 20639-1168
Phone: 410-414-8250
Email:amiept@yahoo.com

PTA Representative
Angela D. Frye-Lewelling, PTA
235 Douglas Dam Road
Kodak, Tennessee 37764
Work in human practice: (865) 429-6584
Work in animal practice: (865) 974-2993
E-mail: K9LPTA@ aol.com

Orthopaedic Section Board Liason
Gary Smith, PT, PhD

SIG Coordinator and Off-Site Continuing Education Coordinator
Jessica Hemenway

CALENDAR OF EVENTS

- The home study course **BASIC SCIENCE FOR ANIMAL PHYSICAL THERAPISTS** is still available. Contact 800-444-3982 or 608-788-3982 for more information.

THE ANIMAL PHYSICAL THERAPIST SPECIAL INTEREST GROUP (ANIMAL SIG) UPDATE:

1. Proceedings of the 2nd International Symposium for Rehabilitation and Physical Therapy in Veterinary Medicine – August 2002, Knoxville, TN. Available now for $20. They are a great resource. Contact David Levine at david-levine@utc.edu.
2. Orthopaedic Section member and nonmember directories are available through the Section Office 800-444-3982 Fax: 608-788-3965 or E-mail: tfred@orthopt.org. There currently are 544 members.
3. State Liaisons: To date there are 33 states that have Animal SIG Liaisons. Contact Siri Hamilton for further information 865-974-2993 and E-mail: sirivtpt@utk.edu.
4. The APTA has a web site that lists all of the State Practice Acts: www.apta.org/advocacy/state/state-practice
5. The offices of Vice President and Nominating Committee Member are still awaiting nominations. Please contact Amie Lamoureaux–Hesbach using her contact information with any nominations.

Collaborative Practice Related to Treatment of Animals

Blair J. Packard, PT
President, Federation of State Boards of Physical Therapy

What follows is a joint draft position paper recently approved by the respective Boards of Directors of the regulatory associations/federations of Veterinary Medicine, Physical Therapy and Chiropractic. The preliminary approval by these three boards represents a culmination of over a year's effort to establish a working relationship and develop consensus on an approach to a challenging and potentially difficult regulatory question. By prior agreement between these three organizations, with this approval each board is now free to share this draft with their membership and seek formal adoption through representative bodies, and also share the draft with wider communities of interest including professional associations to stimulate further dialogue and feedback.

The draft statement that follows is rather self-explanatory. Its genesis began with the simple premise that the therapeutic treatment and rehabilitation of animals is evolving to include non-veterinarians, that the statutory and regulatory landscape is rather barren relative to this evolving practice, and that unless these three regulatory groups take some leadership in addressing this issue, what will inevitably develop will be a rather messy pattern of practice and regulation probably established through costly legislative and regulatory "turf fights" and legal battles over many years. The potential downside of such action may lead far astray of our respective organizational missions relating to public protection.

While the Federation of State Board of Physical Therapy played a role in initiating and supporting the dialogue neces-

sary to develop this position, each organization contributed significant leadership and staff involvement to this process. Within FSBPT, an educational program on this topic will be presented at our annual meeting in Kansas City and a motion will be presented to the Delegate Assembly regarding the position. Similar activities are planned at upcoming AAVSB and FCLB meetings.

We realize fully that there are other questions to address relative to this issue. We believe that the framework proposed in the following position will provide a solid foundation to begin addressing the other questions that will arise.

I extend my thanks and appreciation to the following who graciously participated in this process: Georgie Ludwig, DVM from AAVSB, Richard Cole, DC and David Brown, DC from FCLB, executives and staff Donna Liewer (FCLB), Charlotte Ronan (AAVSB), Bill Hatherill and Christine Larson (FSBPT), and Dale Atkinson, executive director of FARB.

DRAFT Position Statement on Collaborative Practice

For consideration by the American Association of Veterinary State Boards (AAVSB), the Federation of State Boards of Physical Therapy (FSBPT), and the Federation of Chiropractic Licensure Boards (FCLB); developed at the FARB Forum, Austin, Texas, February 8, 2003 and approved for submission to their respective memberships by the respective Boards of Directors during April 2003.

The American Association of Veterinary State Boards (AAVSB), the Federation of State Boards of Physical Therapy (FSBPT), and the Federation of Chiropractic Licensure Boards (FCLB) recognize that practice on animal patients/clients is occurring by physical therapists and doctors of chiropractic in the United States, despite the fact that appropriate regulation does not yet exist in most jurisdictions.

We believe the respective national associations of licensing boards should take a leadership role in drafting model language for use by member boards. Failure to do so will make the regulation of this practice very difficult in the future as each state and each profession develops a different standard.

We applaud the efforts of educators who have developed certification courses to establish standards of care for therapeutic intervention with animal patient/clients related to physical therapy and chiropractic services. However, physical therapists and doctors of chiropractic who are licensed in their respective professions and have obtained a certificate to practice on animals within a narrowly defined scope often are practicing in the absence of chiropractic or physical therapy regulatory authority concerning animal treatment.

We acknowledge that there are situations within the scope of veterinary practice, when an animal patient/client would benefit by a collaborative approach between the primary licensed veterinarian and a licensed physical therapist, doctor of chiropractic or a member of another health care profession who traditionally practices on humans.

We believe that collaborative practice between a licensed veterinarian and a licensed health care professional of another discipline originates with an established Veterinarian-Client-Patient Relationship (VCPR) and is initiated by the primary care veterinarian.

AAVSB, FSBPT, and FCLB endorse the following definition of Collaborative Practice:

> Collaborative practice occurs when two or more licensed professionals from different disciplines work together resulting in a higher level of service for the patient/client than could be achieved if either professional worked independently. All professionals involved with the care and treatment of a patient/client share responsibility, and operate under the jurisdiction of their respective licensing boards.

We believe regulatory authority is necessary to define collaborative practice between veterinarians and physical therapists or doctors of chiropractic and to extend applicable authority to chiropractic and physical therapy licensing boards. Treatment of animals by physical therapists or doctors of chiropractic in the absence of regulatory authority constitutes the unlicensed practice of veterinary medicine.

Draft Statutory Language

[Bracketed language represents options specific to the statutory construction of each state or discipline.]

For inclusion in Physical Therapy and Chiropractic practice acts (In the Model Practice Act for Physical Therapy and for state practice acts with similar structure this would be a new paragraph 4 under Article 4, Regulation of Physical Therapy, 4.01. Lawful Practice):

Nothing in this act shall prohibit a [licensee/physical therapist/doctor of chiropractic] from entering into a collaborative practice agreement with a veterinarian licensed in this state for the provision of care to animal patient/clients. The board may establish [rules/regulations] regarding such agreements. Violation of such agreements shall be grounds for disciplinary action under this [act, chapter, etc.].

Note: As with any drafting of statutory language, consultation with each state's Office of the Attorney General and legislative counsel is advisable to determine the appropriateness of language for practice acts and to avoid conflicts in statutory construction. Special consideration may need to be given to definitions sections that define scope of practice, particularly if that scope appears limited to human patients. The question of whether this model language would be appropriate when compared to scope of practice definitions would need to be determined on a state-by-state basis. Another consideration may include statutory authorization (or development of interagency protocol) for the cooperation of two different licensing boards relative to an investigation or complaint.

For inclusion in Veterinary Medicine practice acts:

Nothing shall prohibit a [licensee/veterinarian] from entering into a collaborative practice agreement with a physical therapist or doctor of chiropractic licensed in

this state. The board may establish [rules/regulations] regarding such agreements. The treatment of animal patient/clients under a collaborative practice agreement shall be subject to all provisions of this [act, chapter, etc.] and applicable rules.

Definition of "collaborative practice" in Veterinary Medicine practice acts:

Collaborative practice between a licensed veterinarian and a licensed health care professional of another discipline originates with an established Veterinarian-Client-Patient Relationship (VCPR) and is initiated by the primary care veterinarian.

If you would like to comment on the above information, please contact Debbie Gross Saunders or David Levine through their fax numbers or email addresses. You will find this contact information listed under the Directory of Officers.

Minutes from the Animal SIG CSM 2003 Meeting
Submitted by Cheryl Riegger – Krugh, PT, ScD

The Animal SIG had a retreat prior to CSM Animal SIG programming. This is the second retreat and has been helpful in planning and connecting for the SIG officers and committee chairs.

Introductions and Congratulations to New Officers:

Each new officer and committee chair in attendance gave a brief history.

New officers:

Debbie Gross Saunders, President
Sandy Brown – Treasurer
Amie Lamoreaux Hesbach – Nominations Committee Chair

Updates

Active SIG members – 542
Interested but nonmembers – 1,078
Home studies purchased – 601

Liaison Between the APTA and AVMA

We need to work with veterinarians and have them contact the AVMA requesting a liaison relationship with APTA.

*The following motion was sent to the Orthopaedic Section:

that the professional group, the American Veterinary Medical Association (AVMA) be added to the list of professional liaisons sought by the APTA.

Support Statement:

The AVMA is a professional liaison relationship that did exist in the past and has recently been sought to reinstate by APTA President Ben Massey, following a lapse. This was done on request of the Animal SIG.

While this liaison relationship was pursued by APTA President Ben Massey, the AVMA has not approved a formal liaison relationship with the APTA, because they have not heard this recommendation from their veterinarian members. The Animal SIG has recommended that veterinarians contact the AVMA. This is a professional relationship that would serve the same purpose as the other professional liaisons for the Orthopaedic Section.

At the Second International Symposium, a number of veterinarians asked to attend the Animal SIG meeting. There was agreement among the veterinarians attending the meeting and the SIG officers that a small group of Veterinarians and Physical Therapists should work together to develop language that would be agreed upon by both groups and used to approach changing the practice acts for both groups. Two of the members would be Presidents of the APTA and American Veterinary Medical Association (AVMA).

State Liaison Coordinator – Siri Hamilton

Siri has written a letter to go to all state liaisons regarding their position and updated credentials. Siri has written a booklet for liaisons. This book is in revision.

Surveys to Veterinarians (Vets) and Physical Therapists (PTs) – Carrie Adamson

A survey of practice has been sent to Vets and PTs.

Duties and Responsibilities of Officers and Chairs –

These are available to anyone requesting them.

We need collective contribution to the Newsletter, as noted in these responsibilities.

Certificate Process

Preparation for clinical practice for PTs and physical therapist assistants (PTAs) in animal rehabilitation preparation is being developed. While these educational groups are not APTA sponsored, Animal SIG members provide recommendations regarding the certificate process. Canine rehabilitation clinical practice is being developed foremost by collaboration of the University of Tennessee Veterinary Medicine and Physical Therapy faculty. The Animal SIG, and especially the Committee on Practice, is providing recommendations regarding eligible participants for animal rehabilitation as well as objectives and outcomes for each of the eligible participant groups. The personal recommendations of the President and Practice Chair for participants of this training are veterinarians, physical therapists, physical therapists assistants, and veterinary technicians, each with their own objectives for education and evaluation of achievement. Recommendations for PTs and PTAs parallel the type of training and supervision established for humans. The responsible people for any certificate process will make the decisions for this training for their own program. Equine clinical practice programs for PT are advancing but are less developed than those for canine rehabilitation.

Recently the completion award for the present Canine Rehabilitation program at the University of Tennessee was determined and is as follows:

Certified Canine Rehabilitation Practitioner (CCRP)™ Guidelines

- There is one certificate program: the Certified Canine Rehabilitation Practitioner (CCRP)™.
- There will be 4 designations within the one certificate program, those designations recognizing the professional

training level or title of the person being certified. The wording of the certificate, along with the appropriate designation, will be printed on the actual certificate awarded as follows:

CCRP - Veterinarian
CCRP - Physical Therapist
CCRP - Veterinary Technician
CCRP - Physical Therapist Assistant

Note: The letter, which will accompany the actual certificate, will indicate that the four designations are designed so as to recognize the limitations or restrictions on canine rehabilitation practice as outlined in the professional state board practice acts.

- There will be differences between the practical exam component of the certificate exam based upon practice restrictions for the following 2 groups:

Group 1: Veterinarians and Physical Therapists
Group 2: Veterinary Technicians and Physical Therapist Assistants

Contact in the APTA for post-professional credentialing –
Carol Jo Tichenor
11478 Cull Canyon Rd
Castro Valley, CA 94552
510-441-4259
caroljo.tichenor@kp.org

Recommended objectives for people participating in a credentialing program in animal rehabilitation were published previously in *OP* and can be requested from the SIG.

Education Committee

Educational programming was discussed related to the 2003 CSM as well as the preconference program to be held in 2004.

Educational Courses

David Levine reported on the very successful Second International Symposium in Rehabilitation and Physical Therapy in Veterinary Medicine in Knoxville, TN in August 2002. Many internationals attended.

Six nations, who have formally established animal rehabilitation groups as recognized by their parent organizations, are needed in order to form a WCPT group. Presently 5 nations—the UK, Netherlands, the US, South Africa, and Finland—have formally established groups.

Newsletter

Arlene has been helping Becky orient to editing the Newsletter. This issue is her last issue to assist Becky.

The June *Orthopaedic Physical Therapy Practice* featured the Animal SIG. Cheryl Riegger-Krugh was Guest Editor.

Legal Issues

Discussion with Ben Massey regarding recommended use of credentials when working with animals. It was suggested that academic, and not professional, credentials be used.

Avoid using MPT, MSPT, etc. as most PTs and PTAs working with animals are working outside of the practice acts in most states.

Practice Act

There was discussion as well as a recommendation on practice act language from Cheryl to include:

Use patient/client language with the addition that if the person is practicing with a patient/client not of their training that relevant certification or credentialing be required for the specific animal for which rehabilitation is provided. (Certification for horses would not allow providing rehabilitation for dogs, for example). See article by Blair Packard in this newsletter.

Liability Insurance

Current advances and current places for PTs to get insurance and liability waivers in veterinary clinics were discussed.

Practice Issues and Practice Analysis Grant

A practice analysis grant was submitted. No grants were awarded last year from the Orthopaedic Section. Comments were requested from Ann Grove/Orthopaedic Section. No comments have been received to date. Joe Godges gave us an example of a Practice Analysis Grant from Primary Care.

Compendium

No progress to date.

The welcome packet for new members into the SIG is still in draft stages.

Nominations Committee

Ballots were mailed through the Orthopaedic Section. If we have an option in the future, I suggest we continue to have the Orthopaedic Section mail the ballot.
2003 – President, Treasurer, Nominating Committee Chair
2004 –VP, Secretary, Nominating Committee Member
Limit: Two 3-year terms for one office

Budget

Carrie Adamson has inquired about funding to send out surveys to PTs, PTAs, Veterinarians, Vet Technicians - we discussed putting these on websites. We can consider for the budget for next year, and this year with special permission or if money is left in the budget. We do have encumbered funds we can use.

SIG Becoming a Section

It appears that the APTA does not want to consider new Sections.

Donation to the Foundation from the SIG

Consider this in next year's budget.

Bylaws

Suggested changes were submitted.

Index to Advertisers

Orthopaedic Physical Therapy Practice Instructions to Authors

Susan A. Appling, MS, PT, OCS, Editor
Sharon L. Klinski, Managing Editor

1. *Orthopaedic Physical Therapy Practice (OPTP)* will publish articles pertaining to clinical practice. Articles describing treatment techniques as well as case studies and reviews of literature are acceptable. Language and format of articles should be consistent with the *Guide to Physical Therapist Practice*.
2. Manuscripts should be reports of personal experiences and written as such. Though suggested reading lists are welcomed, references should otherwise be kept to a minimum with the exception of reviews of literature.
3. Manuscript Preparation Guidelines *(details can be found at www.orthopt.org)*
4. Manuscripts are accepted by mail or electronically. Save your monograph to a 3 1/2" IBM-compatible computer disk in Microsoft Word or plain text format. Provide 2 hard copies of the monograph. Protect any original photographs and artwork for shipment. The manuscript should be sent to:

   Orthopaedic *Physical Therapy Practice*
   ATTN: Managing Editor
   2920 East Avenue South, Suite 200
   La Crosse, WI 54601-7202
   Tel: 800.444.3982 ext 202
   FAX: 608.788.3965
   Email: Sharon Klinski, Managing Editor at sklinski@orthopt.org and
   Susan Appling, Editor at sappling@utmem.edu

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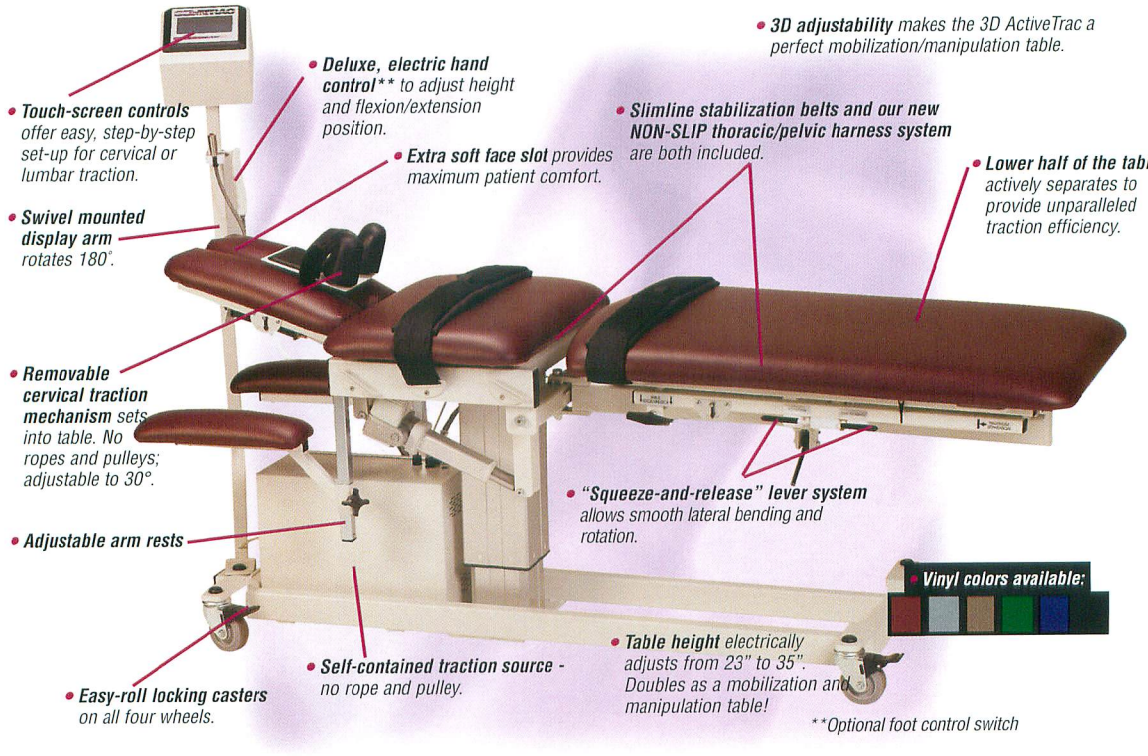

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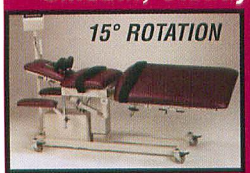

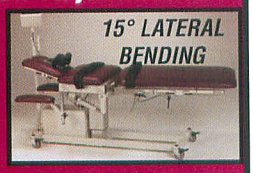

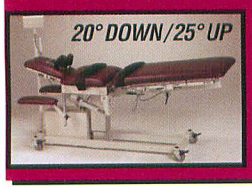

All dimensions are adjusted with easy, one-handed controls. The clinician controls the position of the table and patient at the same time.

"The 3D ActiveTrac not only treats a wide variety of musculoskeletal disorders but at the same time reduces the physical stress and strain on the clinician."
- satisfied 3D ActiveTrac owner

Leasing Options Available

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Orthopaedic Physical Therapy Practice
Orthopaedic Section, APTA, Inc.
2920 East Avenue South, Suite 200
La Crosse, WI 54601